



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

VII.

A History of the Fishes of Massachusetts.

By DAVID HUMPHREYS STORER, M. D., A. A. S.

Continued from Vol. V. p. 296.

FAMILY XIII. CYPRINODONTIDÆ (*continued*).

GENUS II. HYDRARGYRA, LACÉP.

Upper surface of head flattened; but the jaws are not depressed. Fine card-like teeth upon the jaws. Opening of mouth semicircular. Lower pharyngeal teeth with rounded crowns, the medio-posterior ones the largest. Branchial rays six on either side. Dorsal opposite to anal, as in the genus *Esox*. Caudal posteriorly subtruncated. Upper surface and sides of head covered with scales.

HYDRARGYRA FLAVULA, *Storer*.

The Basse Fry.

(PLATE XXIII. FIG. 5. Male. 6. Female.)

Esox flavulus, *New York Gudgeon*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 439, pl. 4, fig. 8.

Cyprinodon flavulus, VAL., in Humboldt and Bonpland, II. p. 164, pl. 62, fig. 3.

Hydrargyra flavula, *The Basse Fry*, STORER'S Report, p. 95.

“ “ AYRES, Bost. Journ. Nat. Hist., IV. p. 267.

“ “ GIRARD, in Lit.

Hydrargyra formosa, STORER, Proc. Bost. Soc. Nat. Hist., I. p. 76.

Hydrargyra trifasciata, STORER, Bost. Journ. Nat. Hist., I. p. 417.

Fundulus fasciatus, *Striped Killifish*, DEKAY, Report, p. 216, pl. 31, fig. 98.

Hydrargyra vernalis, CUV. et VAL., Hist. Nat. Poiss., XVIII. pp. 206, 207.

Hydrargyra flavula, STORER, Mem. Amer. Acad., New Series, II. p. 432.

“ “ “ Synopsis, p. 180.

Color. Female of a yellowish-green above, lighter upon the sides, and white beneath. Several longitudinal, interrupted black bands, sometimes five in number, may

be distinctly seen, at other times not more than one or two, upon the sides, extending from the gill-covers almost the whole length of the fish. At the base of the caudal fin, just at the termination of the longitudinal bands, are three or more less distinct transverse bands of a similar color.

In the male, the sides and back are of a greenish-black; the sides are crossed by numerous slate-colored, nearly black, transverse bands, varying very much in their number and width in different individuals, — some individuals exhibiting ten or twelve bands only, while in others are observed twenty, or even more. In some specimens these bands are of the same size throughout their whole length; in others, they diminish gradually from the centre to the sides towards the abdomen, upon which they are lost. In some specimens these bands are less than the sixteenth of an inch wide; in others, they are quite the eighth of an inch. The lower portion of the sides, as well as the abdomen, is of a beautiful yellowish-green color. The operculum is marked by a large black spot; the preoperculum is fuliginous, sometimes cupreous. The dorsal fin is violet-colored, with a black spot, circular in some individuals, upon the centre of the posterior three or four rays; anterior to this spot, in some of the larger specimens, are three or four broken, dark-colored blotches. The pectorals are yellowish. The ventrals are the color of the abdomen. The anal fin is almost green. The caudal fin is orange-colored, margined at its extremity with black. In the dead fish, the general color becomes much lighter, but the black spots upon the dorsal fin and operculum remain.

Description. Body elongated, slightly convex on the dorsum over the pectorals in the female, nearly straight in the male. Greatest depth of the body, which is across the pectorals, less than the length of the head. The head, which is equal in length to one fourth of the entire length of the fish, is compressed above. The mouth is protractile, with numerous minute teeth in the jaws. The eyes are circular.

The dorsal fin is situated upon the posterior half of the body. In the female, it is nearly quadrangular; in the male, the last rays are quite as high as the first, and the extremities of the rays project beyond the connecting membrane.

The pectorals are higher than the dorsal, and are rounded when expanded.

The anal fin is higher than long; in the female the rays of this fin gradually diminish in height posteriorly, while in the male the sixth and seventh rays are highest.

The caudal fin is broad and rounded when expanded.

The fin rays, in three specimens examined, were as follows: —

D. 16. P. 16. V. 6. A. 11. C. 19.

D. 15. P. 17. V. 6. A. 11. C. 20.

D. 14. P. 18. V. 6. A. 12. C. 18.

Length, one to four inches.

Remarks. This pretty species, called by Mitchill the "New York Gudgeon," and known by our fishermen as the "Basse-fry," from the resemblance of the markings of the female to those of the "Striped Basse," and called by boys the "Yellow-tail," is common in brackish waters in the vicinity of Boston. The two sexes were formerly considered distinct species.

Massachusetts, STORER. Connecticut, AYRES. New York, MITCHILL, DEKAY.

FAMILY XIV. ESOCIDÆ.

Body elongated. One dorsal, generally opposite to the anal. Edge of the upper jaw either formed solely by the intermaxillaries, or, if the labials enter at all into its composition, they are destitute of teeth. Intestinal canal short, without cœca. Branchial rays vary from three to eighteen. Mouth large, and without sharp teeth.

GENUS I. ESOX, CUV.

Head depressed, large, oblong, blunt; intermaxillaries small, with small, pointed teeth at the middle of the upper jaw, of which they form two bands. The maxillaries forming the sides have no teeth. The vomer, palatines, tongue, pharyngeals, and branchial arches bristled with card-like teeth. Sides of the lower jaw with a row of long, pointed teeth.

ESOX RETICULATUS, *Lesueur.*

The Pickerel.

(PLATE XXIV. FIG. 1.)

Esox lucius, *Pickerel*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 440.

Esox reticulatus, LESUEUR, Journ. Acad. Nat. Sciences, I. p. 414.

" " *Common Pickerel*, STORER, Report, p. 97.

" " *Pike*, KIRTLAND, Report, p. 194.

" " *Common Pickerel*, DEKAY, Report, p. 223, pl. 34, fig. 107.

Esox fasciatus, *Varied Pickerel*, DEKAY, Report, p. 224, pl. 34, fig. 110.

Esox reticulatus, *Pickerel*, THOMPSON'S History of Vermont, p. 138.

" " AYRES, Bost. Journ. Nat. Hist., IV. p. 269.

" " *Pickerel*, *Pike*, KIRTLAND, Bost. Journ. Nat. Hist., IV. p. 233, pl. 10, fig. 2.

Esox tredecem lineatus, *Federation Pike*, MITCH., Mirror, 1825, p. 361.

Esox tredecem radiatus, *Federation Pike*, DEKAY, Report, p. 225.

Esox reticulatus, *Pickerel*, STORER, Mem. Amer. Acad., New Series, II. p. 437.

" " " " Synopsis, p. 185.

Le Brochet réticulé (*Esox reticulatus*), LESUEUR, CUV. et VAL., XVIII. p. 327.

Color. The color of this species varies considerably in different localities. Most commonly, however, the body is green above; the sides are of a beautiful golden-

yellow, marked over their whole extent with irregularly distributed dark, longitudinal lines, which by their union produce imperfect reticulations. The body beneath is white, the throat is flesh-colored. The pupils are black; the irides greenish, with a golden ring upon their anterior edge. Beneath the eyes, a deep black band passes perpendicularly to the lower edge of the gill-covers. The dorsal fins are of a greenish-black. The pectoral, anal, and ventral fins are flesh-colored.

Description. Body subcylindrical, much flattened upon the back. The scales are very small. The length of the head is one third less than that of the body, and it is flattened above. The snout is obtuse. The mouth is capable of very great distention. The tip of the lower jaw projects beyond the upper. Teeth on the upper maxillary small; teeth on the anterior portion of the lower jaw small, exceedingly sharp, and incurved; a few on the sides of the lower maxillary quite large, with cutting edges; the palatine bones are armed with numerous incurved teeth, the innermost row the largest; strong teeth are also seen upon the maxillary bones; the vomer, the branchial arches, and the base of the tongue, are likewise furnished with minute teeth. The eyes are moderate in size; they are irregularly oval, their longest diameter being from before, backwards. The nostrils, which are situated in a groove, are quite large; the posterior is much the larger.

The dorsal fin, which is subquadrangular, is situated a short distance in front of the tail. Its fourth and fifth rays are higher than the length of the fin; the first three rays are single, and firmer than the others; the first is about one fifth the height of the fourth; the second is as high again as the first; the third, not as high again as the second.

The pectorals commence on a line with the sixteenth branchial ray; their height is equal to the length of the dorsal fin. They are rounded when expanded.

The ventrals are situated on the anterior half of the body, and they likewise are rounded when expanded. Their rays are multifid. These fins are shorter than the pectorals.

The anus is large, and situated just in front of the anal fin.

The anal fin commences opposite the middle of the dorsal, and is of nearly the same form and size as that fin.

The caudal fin is forked.

The fin rays are as follows: — B. 17. D. 18. P. 13. V. 9. A. 17. C. 19 $\frac{7}{8}$.

Length, one to two feet.

Remarks. This fine species is the common Pickerel of Massachusetts. It is generally diffused throughout the State, and is everywhere valued. Specimens

may be met with in Boston market almost any month in the year, although greater numbers are taken in the spring and autumn, and some years during the winter. The largest specimens I have seen were brought from Brewster, Cape Cod. Individuals from that place weighing seven pounds have been sold in our market, and they are said to be taken there considerably larger even than this. They are generally caught with the hook; considerable quantities, however, are speared, in some cases through the ice; at other times individuals go out in boats in the evening with lights, the pickerel are attracted, and are speared as they collect round the boats.

Maine, Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, DEKAY. Ohio, KIRTLAND.

ESOX ORNATUS, *Girard*.

The Smaller Pickerel.

(PLATE XXIV. FIG. 2.)

Esox ornatus, GIRARD, Proc. Bost. Soc. Nat. Hist., v. p. 41. 1854.

Color. A darkish-green, barred transversely and quite regularly with narrow blackish-brown bands, some twenty in number, which hardly reticulate; not at all posteriorly. The black band beneath the eye pointing somewhat obliquely backward. Throat stained with fuliginous.

Description. Very similar in its characters to those of the *reticulatus*. The following differences are observable. Head considerably more than one fourth the whole length of the body; in the *reticulatus* it is one fourth.

The distance of the ventrals before the anal fin is about one quarter of the whole length; in the *reticulatus* it is not one sixth.

The pectorals commence on a line with the sixth branchial ray; in the *reticulatus*, on a line with the sixteenth.

The fin rays are as follows: — D. 11. P. 13. V. 9. A. 11. C. 19.

Length, seven and a half inches.

Remarks. This species is not unfrequently noticed in Boston market, and is so similar to the *reticulatus* that it has heretofore been considered to be the young of that species.

Massachusetts, GIRARD, STORER.

GENUS II. BELONE, CUV.

Head and body greatly elongated ; the latter covered with minute scales. Both jaws very much produced, straight, narrow, and pointed ; armed with numerous small teeth, those of the pharynx paved. Scales not very apparent, except a longitudinal range, carinated on each side near the inferior edge.

BELONE TRUNCATA, *Lesueur*.*The Gar-fish.*

(PLATE XXIV. FIG. 3.)

Esox Belone, *Bill-fish*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 443.

Esox longirostris, *Long-jawed Fresh-water Pike*, MITCH., Amer. Month. Mag., II. p. 322.

Belone truncata, *Gar or Bill-fish*, LESUEUR, Journ. Acad. Nat. Sc., II. p. 126, fig.

“ “ *Gar-fish*, STORER, Report, p. 98.

“ “ *Banded Gar-fish*, DEKAY, Report, p. 227, pl. 35, fig. 112.

“ “ STORER, Mem. Amer. Acad., New Series, II. p. 438.

“ “ “ Synopsis, p. 186.

L'Orphie à caudale tronquée (*Belone truncata*, LESUEUR), CUV. et VAL., XVIII. p. 422.

Color. After being preserved in salt, this fish is of a light-green above ; beneath silvery, including opercles and lower mandible. Just above the base of the pectorals a band of a darker color arises, and passes in a straight line to the origin of the dorsal fin. Minute fuliginous spots upon the upper portion of opercles.

Description. The body is elongated ; the scales small and orbicular. The lateral line arises at the inferior angle of the operculum, and, passing gradually up to the inferior base of the pectorals, assumes thence a straight line, which is continued to the base of the caudal rays. Its greatest depth is equal to about one fifteenth its entire length ; the length of the head, from the angle of the jaws to the posterior portion of the operculum, is equal to one tenth the length of the body. The jaws are armed with distant, very sharp, conical teeth, between which are numerous others very minute ; the lower mandible projects beyond the upper, and is fleshy at its tip. The head is flattened above, and compressed laterally ; the eyes are longitudinally oval ; the distance between the eyes is equal to their longer diameter. The nostrils are situated in a triangular space just in front of the eyes.

The dorsal fin is situated on the posterior fourth of the body ; its anterior rays are highest, and it is emarginated posteriorly.

The pectorals are directly back of the posterior angle of the operculum ; their length is equal to one fourth the height of their longest rays.

The ventrals are situated upon the posterior half of the body ; their length is equal to one fourth of their height.

The anal fin is of the same form as the dorsal; it commences just in front of that fin, and is coterminous with it; its anterior rays are longer than the corresponding ones of the dorsal fin.

The caudal fin is slightly emarginated.

The fin rays are as follows: — D. 15. P. 12. V. 6. A. 19. C. 19.

Length, one to two feet.

Remarks. The only specimens I have seen of this species were sent to me by Dr. Yale, from Holmes's Hole, where it is called "Gar-fish."

Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, LESUEUR, MITCHILL, DEKAY. Pennsylvania, Rhode Island, LESUEUR.

GENUS III. SCOMBERESOX, CUV.

Have the same structure of the jaws as the *Belone*; and are similar, also, in the form of the body and scales, with a keel-like edge to the belly; but the posterior portions of the dorsal and anal fins are divided, forming finlets, as in the Mackerel.

SCOMBERESOX STORERI, *Dekay*.

The Bill-fish.

(PLATE XXIV. FIG. 4.)

Scomberesox equirostrum, LESUEUR, Journ. Acad. Nat. Sc., II. p. 132.

Scomberesox scytellatum, LESUEUR, Journ. Acad. Nat. Sc., II. p. 132.

Scomberesox equirostrum, *Bill-fish*, STORER, Report, p. 100.

Scomberesox Storeri, *Bill-fish*, DEKAY, Report, p. 299, pl. 35, fig. 111.

" " STORER, Mem. Amer. Acad., New Series, II. p. 439.

" " " Synopsis, p. 187.

Le Scombrésoce equirostre (*Scomberesox equirostrum*, LESUEUR), CUV. et VAL., XVIII. p. 479.

Color. The dorsum is of an olive-green color; beneath this, a strongly-marked silvery band, half an inch wide, runs the whole length of the body, divided in its centre by a narrow longitudinal line of the same color as the back; the abdomen and gill-covers are satiny. The dorsal fin is greenish, as well as the finlets posterior to it. A dark-green spot is situated at the base of the pectorals, above. After death, the olive-green upon the back becomes a coppery green; the sides lose their splendor, and the fins their transparency.

Description. Body elongated, compressed, gradually lessening in depth back of the anus. Head, including the jaws, equal to one fourth the length of the body; gill-covers large, smooth; the lower jaw the longer; the jaws, at their origin, are armed

with very minute teeth. The eyes are moderate; their diameter is equal to one twelfth the length of the head; the distance between the eyes rather greater than their diameter. Nostrils large.

From the lower edge of the operculum, extending to the fourth anal finlet, forming the lateral boundaries of the abdomen, are two yellowish lines, which are continued series of scales; when raised they resemble serrations, when not erect they look like sinuses. Between these rows of scales are situated the ventrals, the anal, and the anal finlets.

The dorsal fin is small, and situated upon the posterior third of the body. It is longer than high; the first and second rays are simple; the first is about half the height of the second; the first three or four rays are articulated. Posterior to this fin are situated five, and in some specimens six, finlets.

The triangular pectorals are situated at the posterior angle of the operculum; the first ray is longer and broader than the others.

The fan-shaped ventrals are situated just back of the centre of the body.

The anal fin commences about opposite the dorsal, and terminates nearly on a line with it. Back of this fin are five or six finlets.

The caudal fin is deeply forked, the lower lobe projecting slightly beyond the upper; the rays are articulated. In the recent fish the fleshy portion of the tail is continued to the top of the central rays, presenting a large silvery patch.

The fin rays are as follows: — D. 10, v. or vi. P. 14. V. 6. A. 12, v. or vi. C. 20. Length, ten inches.

Remarks. This is one of our most beautiful species. It usually appears in the month of October, sometimes earlier and sometimes later, however, depending upon the season. Large quantities are yearly thrown upon the shore at Provincetown, and are considered worthless, while by the inhabitants of some of the other towns upon Cape Cod it is taken in immense numbers, and is considered by them very nutritious food.

In the year 1821, Lesueur read to the "Academy of Natural Sciences of Philadelphia" a description of this species; to use his own words, "taken from an individual preserved and dried in the cabinet of the Linnæan Society of Boston, under the name of *Saurus*. It cannot be regarded as sufficiently complete, but may serve to call the attention of others who may have a better opportunity of completing its description." In my "Report on the Fishes of Massachusetts," published in 1839, I had an opportunity of presenting a description drawn up from recent specimens; and under the head of this species, I made the following observations: — "Lesueur's description

shows his specimen to have been an imperfect one. I have seen no specimen in which the jaws were of equal length; the lower jaw was undoubtedly broken in the specimen seen by Lesueur, as is very apt to be the case in dried specimens of this genus, else he could not have called it '*equirostrum*'; still, as some naturalists think a specific name need not point out any particular character, and as I have no desire to detract from the labors of another, I shall merely point out the characters as they exist in the recent specimen, and leave Lesueur's name to be changed, should it ever be thought advisable, by some succeeding ichthyologist." In 1842, Dekay published his "Zoölogy of New York." In his volume on the Ichthyology of that State, while describing this species, he says: "The original notice of this species by Lesueur was made from an imperfect and dried cabinet specimen; and his name, of very dubious Latinity, and drawn from a false character, must be rejected. The name which I have attached to it is due to the distinguished ichthyologist who pointed out distinctly the impropriety of the appellation, and was its first accurate describer." Dr. Dekay having thus agreed with me in the opinion of the "impropriety" of Lesueur's specific name, I did not hesitate to adopt the one he proposed, in my "Synopsis of the Fishes of North America," published in 1846, however much I may have desired that it should be a different one. Valenciennes, in the eighteenth volume of his "Histoire Naturelle des Poissons," insists upon retaining Lesueur's name of "*equirostrum*," — because, having received a specimen of *Scomberesox* from Chili, and compared it with Lesueur's figure, he says "it is impossible to doubt their specific identity." He thinks, if any differences are noticeable in Lesueur's description from the Chilian fish, that they are referable to the fact that that description was made from a dried specimen. Now what are the facts? Lesueur's description was not accompanied by a figure. He himself was aware that his specimen was imperfect, and that his account could "not be regarded as sufficiently complete." Valenciennes seems to have forgotten that the most likely accident to happen to a dried specimen of this species is a fracture of the lower jaw; that it is a rare thing to find a specimen, thus preserved, perfect in this respect; and if he refers to his description of the Southern fish, he will notice the caudal fin contains twenty-seven rays, while in the descriptions of Lesueur, Dekay, and my own, there are uniformly twenty rays in that fin. Unconvinced that Dekay and myself are in error, I cannot yield my convictions to the authority of the justly celebrated French ichthyologist.

Newfoundland, LESUEUR. Massachusetts, STORER. New York, DEKAY.

FAMILY XV. FISTULARIDÆ.

Characterized by a long tube in the fore part of the cranium, formed by the prolongation of the ethmoid, vomer, preopercula, interopercula, pterygoideals, and tympanals, and at the extremity of which is the mouth, composed, as usual, of the intermaxillaries, maxillaries, and the palatine and mandibular bones. Their intestine has neither great inequalities nor many folds, and their ribs are short or wanting. Some of them, the *Fistulariæ*, have a cylindrical body; in others, the *Centrisci*, it is oval and compressed.

GENUS FISTULARIA, LACÉP.

Body elongated, cylindrical. Dorsal opposite to the anal. The intermaxillaries and the lower jaw are armed with small teeth. From between the two lobes of the caudal proceeds a filament which is sometimes as long as the body. The tube of the snout is very long and depressed. The natatory bladder is excessively small, and the scales are invisible.

FISTULARIA SERRATA, *Bloch*.*The Tobacco-pipe Fish.*

(PLATE XXV. FIG. 1.)

*Petimbuabo Brazil, Tobacco-pipe Fish, CATESBY, Hist. Carol., II. p. 17.**Fistularia serrata* (?), *BLOCH*, variety of *tabacaria*." " *SHAW*, *Gen. Zoöl.*, v. pl. 107, fig. of tube." " *Tobacco-pipe Fish, STORER*, *Report*, p. 80." " *American Pipe-fish, DEKAY*, *Report*, p. 232, pl. 35, fig. 113." " *STORER*, *Mem. Amer. Acad.*, New Series, II. p. 443." " " *Synopsis*, p. 191.

Color. Back a light drab. Abdomen silvery. A narrow brownish-blue band along the sides. Throat white. Irides silvery.

Description. Body to dorsal cylindrical, greatly elongated; between dorsal and caudal, flattened from above. Head of but little less diameter than body. Snout prolonged into a lengthened tube, the distance from the orbit to the tip of the lower jaw being nearly four times that from the orbit to the posterior angle of the operculum. Whole length of head rather more than a third of whole length of body, exclusive of caudal filament; its depth but little less than that of the body, and one ninth its whole length. Snout horny, somewhat broader than deep; strong longitudinal ridges along its top, sides, and base. The lateral ridges extend from the anterior and superior edge of the orbit to the tip of the upper jaw, and are strongly serrated nearly the whole

distance; the lower ridges with small and crowded reticulating striæ, like those of a file. Gape of mouth large in proportion to diameter of tube. Lower jaw the longer, and somewhat curved upwards. A fleshy protuberance at chin. Both jaws with numerous small, sharp, recurved teeth. Nostrils double (Dekay says single), just in front of anterior superior orbital spine, the posterior being the smaller. Orbits elliptical, greatly ridged, with blunt spines anteriorly both above and below, and posteriorly above. Top of head strongly ridged. Opercula with radiating striæ.

Shoulders covered by horny plates extending deep upon the sides, and reaching posteriorly two thirds the distance between the pectoral and ventral fins. Skin slightly roughened, but no scales visible.

The lateral line commences above and a little anterior to the superior angle of the opercle, curves slowly upwards, and again downwards, to the posterior extremity of the humeral plates, just described, then, taking the middle of the side, pursues a straight course to the centre of the caudal, whence it is evidently prolonged as the longer caudal filament; from the humeral plates it gradually becomes furnished with more and more distinct broad longitudinally-flattened spines.

Dorsal small, triangular, the central rays the longer; directed sharply backwards. Situated on posterior sixth of fish. Less than one half as broad as long.

Pectorals also in breadth less than one half their length; quadrangular, and of moderate size; situated just posterior to the opercle.

Ventrals very small, oblong, three eighths of the distance between pectorals and anus.

Anal just beneath dorsal, with which it is identical in size and shape.

Caudal deeply forked. From its central point, and in continuation of the lateral line, arises a delicate jointed filament, in length nearly half that of the body; not far from its extremity this filament seems to have been broken in the specimen described, giving rise to little diverging threads, which were described by Dekay, from the same specimen, as natural bifurcations. Just beneath the long filament, and from its base, arises a second, one sixth its length and much more delicate.

The fin rays are as follows: — D. 14. P. 16. V. 6. A. 14. C. $16\frac{3}{4}$.

Length, exclusive of filament, nineteen inches.

“ including filament, twenty-eight inches.

Remarks. The only specimen I have seen of this species was procured at Holmes's Hole by the late Dr. Yale of that place. It belongs to the cabinet of the Boston Society of Natural History. It served for the description contained in my Report. I loaned it to Dr. Dekay, who described and figured it in his Report on the Fishes of New York. I now redescribe it, and Mr. Sonrel furnishes an admirable drawing.

I stated in my Report, that I considered this fish to be the *serrata*, although I had no means of ascertaining what that species was, having no works upon Ichthyology which would assist me. Dr. Dekay, under date of June 7th, 1841, wrote me that I was right in my supposition, as he had compared my specimen "directly with one he had brought from Brazil some years ago."

Massachusetts, STORER. Jamaica, CATESBY.

FAMILY XVI. SALMONIDÆ.

Body scaly. First dorsal with soft rays, the second small and adipose. Numerous cœca, and a natatory bladder. The structure and armature of the jaws vary surprisingly. Almost all of them ascend rivers.

GENUS I. SALMO, LIN.

Head smooth; teeth on the vomer, both palatine bones, and all the maxillary bones; branchiostegous rays varying in number, generally from ten to twelve, but sometimes unequal on the two sides of the head of the same fish.

SALMO SALAR, *Lin.*

The Salmon.

(PLATE XXV. FIG. 2.)

Salmo salar, LIN., Syst. Nat. (12th edit.), p. 509.

" " BLOCH, I. pl. 20 (female); III. p. 98 (male).

" " SALMON, PENNANT, Brit. Zoöl., VIII. p. 382.

" " Common Sea-Salmon, SHAW, Gen. Zoöl., v. p. 40, fig. 102.

" " Salmon, FLEMING, Brit. An., p. 179, sp. 40.

" " " JENYNS, Brit. Vert., p. 421.

" " " GRIFFITH'S CUV., x. p. 416.

" " " FABRICIUS, Fauna Grœnlandica, p. 170.

" " Common Salmon, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 435.

" " " " DE WITT CLINTON, Trans. Lit. and Phil. Soc. of N. Y., I. pp. 147, 498.

" " " " RICH., Fauna Boreal. Americ., III. p. 145.

" " Salmon, STORER, Report, p. 104.

" " Common Sea-Salmon, DEKAY, Report, p. 241, pl. 38, fig. 122.

" " Salmon, THOMPSON, Hist. of Vermont, p. 140.

" " " STORER, Mem. Amer. Acad., New Series, II. p. 444.

" " " " Synopsis, p. 192.

Salmo, CUV. et VAL., Nat. Hist. des Pois., XXI. p. 169.

Color. This species is of a beautiful, brilliant silver-color above, lighter upon the sides, white beneath; many black blotches are observed upon the sides, which are much

more numerous above the lateral line; frequently these blotches surround the outline of the scales, or occupy only a portion of each scale. Upon the scaleless head these spots are unbroken; they are of a deeper color, and are generally circular. The head is darker-colored above, than the back of this fish; the greater portion of the gill-covers is of a light silver-color. The pupils are black, the irides silvery. The inside of the jaws and the edges of the tongue are dusky. The dorsal fin is rather darker-colored than the back, and has one or two longitudinal rows of black blotches upon its base. The adipose fin is dark brown. The pectorals are dark-colored above, lighter beneath. The ventrals are dusky above, white beneath. The anal fin is white. The caudal fin is of a dark-brown color.

Description. Body elongated. The length of the head is less than one sixth the length of the entire fish; the greatest depth of the fish is equal to three ninths its length; its greatest width is less than one sixth its length. The eyes are small; their diameter is equal to one quarter of the distance between them. The nostrils are situated vertically nearer to the eyes than to the extremity of the snout. The upper jaw is the longer, and receives into a notch at its middle the prominent tip of the lower jaw. The lateral line is nearly straight, and is situated just above the middle of the body.

The dorsal fin arises upon the anterior half of the body; its first rays are nearly equal in height to the length of the fin. The *adipose fin* is situated a short distance in front of the tail; its length is equal to one third of its height.

The pectorals commence in front of the posterior angle of the gill-covers; their length is equal to one fourth their height.

The ventrals begin on a line opposite the posterior portion of the dorsal fin, and have on their sides a large axillary scale.

The anal fin is higher than long. The anus is large, and is edged by the extremities of the surrounding scales.

The fleshy portion of the tail extends considerably further forwards in its middle than on the sides, leaving the rays on the sides much the longer; the length of the central caudal rays being only about one third the length of those upon the sides.

The fin rays are as follows: — D. 12. P. 15. V. 9. A. 10. C. 19.

Length, two to three feet.

Remarks. This excellent fish is almost entirely driven from the waters of our State, by the numerous dams and manufacturing establishments which have been erected within a few years, preventing it from going up the rivers to deposit its spawn. About sixty years since it was very abundant in Merrimack River; so much so, that nine individuals have been taken in an afternoon by one person with a dip-net, and the usual

price was eight cents per pound. Between twenty and thirty years ago, two wagons, each bringing from thirty to forty salmon from the Merrimack River, supplied the Boston market every week during the season of the fish. The few individuals now taken in our rivers are looked upon as rarities, and our market is supplied by the fisheries of the Kennebec River and Nova Scotia. The average weight of the Merrimack salmon was from nine to twelve pounds, and from sixteen to twenty-two pounds. The largest weigh from thirty to forty pounds. They have been caught during every month of the year. The greatest run of salmon up the rivers is about the first of June. The fishermen say the young salmon are never seen on their return.

The price of salmon has varied in Boston market of late years from two dollars to twenty cents per pound. The largest specimen I have heard of being sold in the market here weighed thirty-five pounds; and the greatest price ever received for one individual in the same market was fifty dollars.

Labrador, Canada, Newfoundland, and Nova Scotia, RICHARDSON, DEKAY. Maine, New Hampshire, and Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

SALMO FONTINALIS, *Mitchill*.

The Common Brook-Trout.

(PLATE XXV. FIG. 3.)

Salmo fontinalis, *Common Trout*, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 435.

Salmo nigrescens, *Black Trout*, RAF., Ichth. Ohien., p. 45.

Red-spotted Trout, DOUGHTY, Cabinet of Nat. Hist., I. p. 145, pl. 13.

Salmo fontinalis, RICH., Fauna Boreal. Americ., III. p. 176, pl. 83, fig. 1; pl. 87, fig. 2 (head).

" " *Common Brook-Trout*, STORER, Report, p. 106.

" " *Speckled Trout*, KIRTLAND, Report, pp. 169, 194.

" " *Brook-Trout*, THOMPSON, Hist. of Vermont, p. 141.

" " " DEKAY, Report, p. 235, pl. 37, fig. 120.

Baione fontinalis, *Spotted Troutlet*, DEKAY, Report, p. 244, pl. 20, fig. 58.

Salmo fontinalis, *Brook-Trout*, AYRES, Bost. Journ. Nat. Hist., IV. 273.

" " *Common Brook-Trout*, KIRTLAND, Bost. Journ. Nat. Hist., IV. p. 305.

" " " " STORER, Mem. Amer. Acad., New Series, II. p. 444.

" " " " " Synopsis, p. 192.

" " CUV. et VAL., Nat. Hist. des Pois., XXI. p. 266.

Color. The upper part of the body is of a pale-brown color, mottled with darker undulating, reticulated markings; the sides lighter, with a great number of circular yellow spots, varying in their size from a small point to a line or more in diameter, and many of them having in the centre a bright-red spot; sometimes, the yellow color sur-

rounding them having partially disappeared, they seem distinct from the circular spots, or are surrounded by a dull-bluish halo; these red spots differ exceedingly in number in different specimens; in some, three or four only are observable, and these are situated below the lateral line; in others, twenty or more are seen, scattered above and below the lateral line indiscriminately, presenting a beautiful appearance. The body beneath is white, yellowish-white, slightly or dark fuliginous. Head above, darker than the back of the fish. Gill-covers golden, with fuliginous. The dorsal fin is yellow, with irregular transverse black bands. The first ray of the pectorals and ventrals is white, the second is dark-colored, the remainder red. The first ray of the anal fin is white; the remainder of the fin is generally red. The caudal fin is of a dirty reddish-brown, mottled with black spots.

Description. Body elongated, compressed. The length of the head is equal to about one fifth the whole length of the fish; the top of the head is flattened; the snout is obtuse. The eyes are large and circular. The distance between the eyes is equal to one fifth the length of the head. The jaws are equal in length; the gape of the mouth is large; the teeth are sharp and recurved; the teeth on the tongue are larger than those in the jaws; there are teeth also on the palatines and vomer. The scales are very small; those on the lateral line, which pursues a straight course, are larger than those on the rest of the body.

The quadrangular dorsal fin is situated upon the anterior half of the body; the adipose fin is quite small, and near the tail.

The pectorals arise in front of the posterior angle of the operculum; their length is equal to one quarter of their height.

The fan-shaped ventrals commence opposite the middle of the dorsal fin; when unexpanded, their extremities together form a sharp point.

The anal fin arises in front of the adipose fin, and is higher than long.

The caudal fin is deeply emarginated.

The fin rays are as follows: — D. 11. P. 13. V. 8. A. 11. C. 19.

Length, eight to twenty inches.

Remarks. This is quite a common species in our waters. It is frequently met with in the market, where it is readily sold. It is a delicious fish, and is much valued by epicures. It is taken at Sandwich in considerable quantities, not less than one thousand pounds yearly. It is quite common to find them in the wells in the vicinity of Sandwich, living there for years and attaining a large size.

It varies from a quarter of a pound to a pound and a half. Dr. Dekay speaks of a specimen weighing four and a half pounds; and Mr. Henry Blood, of New Bedford,

informed me that he caught one at Enfield, New Hampshire, which weighed nine pounds.

The following interesting observations upon the habits of this species were sent me by my friend, J. B. Forsyth, M. D., of Chelsea, formerly of Sandwich, and with his consent were published in the fifth volume of the Boston Journal of Natural History.

“The few observations I have to communicate upon the habits and peculiarities of the Salmon-Trout were made during a residence of ten years in Sandwich, Cape Cod, where the facilities for that purpose are abundant.

“It may be well to premise, that the distance, at this point of the Cape, from one bay to the other, varies from five to ten miles, and the land is gradually elevated from each shore till it reaches the centre, and consequently the streams, for the most part arising from springs, are short, terminating in creeks upon the marshes. Many of these are of sufficient magnitude for mill-sites, and are therefore crossed by permanent obstructions; and hence it frequently happens, in the short space of a quarter of a mile, you find specimens of both, as they are familiarly called, the fresh and salt water trout.

“The following varieties in color and appearance have been observed.

“1st. Those having the upper part and sides of a pale-brown, gradually becoming less so till it terminates in white on the under part, having a silvery appearance when first taken from the water, and covered with small, distinct scales, the circular yellow and red spots very indistinct; generally found in the marshy creeks or open streams, where the sun has free access. They are well fed upon minnows and shrimps, have a plump appearance, and are the variety mostly sought after by those who desire the trout, in its highest perfection, for the table. They are taken mostly between the months of January and July. They vary in size from one fourth of a pound to four pounds; but I have never seen one to exceed two and a half.

“2d.. Those having the upper part and sides of a dark brown, having a dark-green appearance, terminating in white or orange underneath, and covered more or less with round yellow spots, with a bright-red centre, color varying according to the location, and generally not so plump and well fed as those above mentioned.

“3d. Those having the upper part and sides of either a light or dark brown, with spots more distinctly marked on the dark than the light; underneath, the color uniformly ferruginous or orange.

“Each of these varieties is found both in the streams communicating with the salt marshes, and in those which are entirely cut off from them by permanent obstructions. The first-named variety, however, is nowhere found in so great perfection as in close

approximation to the salt creeks. The difference between the salt and fresh-water trout, in this vicinity, seems to be only in name, so far as I have been able to determine, with ample opportunities in taking them, and with specimens before me. The peculiarity of these varieties seems to depend entirely upon the location, and the nature of the soil at the bottom of the stream they inhabit. The first variety is found in clear water, with light gravelly bottom, and where the banks are not shaded by shrubbery, but where they are almost constantly exposed to the rays of the sun. The second variety inhabits streams which are for the most part shaded by trees, or which take their rise in or pass through peat-bogs. Thus, in one stream, the trout caught at the head of it were always of a very dark brown, almost black, highly marked with yellow and red spots, while those taken near the mouth of the stream were of a light color. One of these streams arises from a deep basin of dark water, thirty feet in diameter and ten feet deep, surrounded by a peat-bog, where the fish taken, so far as I know, have been uniformly of a dark brown. In other streams, having a bottom of iron ore, they are uniformly marked with orange beneath, the color of the upper part and sides appearing to depend upon the amount of exposure to the sun's rays. These observations are made independent of any of the changes of color or markings which take place during the spawning season.

“About the first of January, these fish are found congregated together at high-water mark, and seem to have come down the stream for the purpose of locating themselves in the marshes, where they can obtain food. So uniform are they in this, that for a number of years it was my custom to visit one particular stream during this month; and I was always sure to find them assembled in waiting for me, within a few rods of the same spot, in number I cannot say how many, but I would take of them varying from sixty to seventy-five.

“During the months of February, March, and April they become separated, and are distributed the whole length of the creeks, and about the first of May begin again, in small numbers, to ascend the stream. This they continue to do as the season advances, and their means of sustenance increases (which is principally insects and flies), till about the middle of October, when they are found in great numbers as near up as they can conveniently get to the origin of the stream. This is their spawning season; and having deposited their spawn, they begin to wend their way down the stream, for the most part in a body, till they again reach the marshes.

“These fish were formerly taken in considerable numbers with a kind of net used in the herring fishery; but this method of taking them is, I believe, prohibited by legislation. They are now taken, for the most part, with line and hook, baited with minnow,

shrimp, or earth-worm ; or at some seasons of the year, with the artificial fly, more especially in the fresh ponds.

“ Two other methods of taking them have been resorted to in the small streams, both of which deserve a passing notice ; the first is by titillation, so called, and the second, hooking them up by the caudal extremity, decidedly the meanest way of taking them.

“ The method of taking them by titillation is this. About the spawning season they are found, for the most part, in the small and narrow head streams, and seem more sluggish than at any other season of the year, and less inclined to take the bait. Having arrived at the edge of the stream, the hand is carefully and gently passed along under the banks, till it comes in contact with the fish, generally near the tail. The titillation then commences, and the hand is made to approach towards the head, till sufficiently forward to prevent slipping through the fingers, when by a sudden grasp it is landed upon the shore, the fish remaining perfectly quiet during the process. This mode of taking them I have practised in one stream three years in succession, and taken many fine trout.

“ The unscientific mode of hooking them up by the caudal extremity is also practised at the spawning season, when they are averse to taking the bait, and when and where the stream is deeper and wider. The manner is as follows. A large-sized hook, made very sharp, is fastened to the end of a long, straight stick or piece of whalebone. The fish is then sought, and generally found beneath the root of an old tree, or under the shadow of a log, with the head and part of the body out of sight ; the hook is then carefully introduced near the extremity of the fish, and by a sudden jerk is inserted so as effectually to secure him.”

Labrador, H. R. STORER. Maine, Massachusetts, STORER. Connecticut, LINSLEY, AYRES. Vermont, THOMPSON. New York, MITCHILL, DEKAY. Pennsylvania, DEKAY. Ohio, KIRTLAND. Lake Huron, RICHARDSON.

GENUS II. OSMERUS, ARTEDI.

Body elongated, covered with small scales ; two dorsal fins, the first with rays, the second fleshy, without rays ; ventral fins in a vertical line under the commencement of the first dorsal fin. Teeth on the jaws and tongue very long, two distinct rows on each palatine bone, none on the vomer, except at the most anterior part. Branchiostegous rays, eight.

OSMERUS VIRIDESCENS, *Lesueur*.*The Smelt.*

(PLATE XXV. FIG. 4.)

Salmo eperlanus, *Smelt*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 435.*Osmerus viridescens*, LESUEUR, Journ. Acad. Nat. Sc., I. p. 230.*Salmo* (*Osmerus*) *eperlanus*, RICH., Fauna Boreal. Americ., III. p. 183.*Osmerus eperlanus*, *Smelt*, ART., STORER's Report, p. 108.*Osmerus viridescens*, *American Smelt*, LESUEUR, DEKAY's Report, p. 243, pl. 30, fig. 124.

" " STORER, Mem. Amer. Acad., New Series, II. p. 449.

" " " Synopsis, p. 197.

" " CUV. et VAL., Hist. Nat. Poiss., XXI. p. 388.

Color. When alive, this species, above the lateral line, is of a yellowish-green color with cupreous reflections, the scales being ornamented with exceedingly minute black dots; the sides, beneath the lateral line, are of a silvery-white; the abdomen, of a milky-white; the upper portion, beneath the lateral line, presents the appearance of a satin band the entire length of the body; the upper edge of this band is of a beautiful violet tint. Opercles golden. The dorsal and caudal fins are of the color of the back; the ventrals and anals are white; the pectorals are yellowish-white.

Description. Body elongated, cylindrical. Its greatest depth is just in front of the dorsal fin; its depth at the base of the caudal fin is less than half the depth of the head across the operculum. The length of the head to the whole length of the fish is as 1 to 5. The head is destitute of scales. The lower jaw is longer than the upper, with several sharp, recurved teeth; the front upper teeth much larger than the others, and very sharp. A single row of sharp teeth on the palatine bones. Three or more teeth on each side of the tongue; a tooth at the tip of the tongue much larger than the others. Labials delicately denticulated throughout the whole extent. Gape of the mouth wide. Nostrils large, double; the posterior the longer. Eyes circular, pupils black, irides silvery. Diameter of the eye equal to three fourths the distance between the eyes.

The lateral line commences at the superior angle of the operculum, and is continued in a straight course to the tail, being more obvious in front of the dorsal fin.

The dorsal fin arises opposite the ventrals. The first ray is one third as high as the second ray; the second ray is one third higher than the length of the fin. The rays are branched at their extremities. The adipose fin, which is quite narrow, is situated over the posterior portion of the anal fin, at a distance greater than the length of the head, back of the first dorsal fin.

The pectorals are situated just beneath the inferior angle of the operculum. Their

first ray is of a dark-brown color; they are of the same height as the first rays of the dorsal fin.

The ventrals commence on a line with the origin of the dorsal fin, and are not quite as high as the pectorals; their rays are multifid.

The anal fin is situated at the same distance back of the ventrals that the ventrals are back of the pectorals; it is longer than high, and its length is equal to the height of the pectorals.

The caudal fin is deeply forked.

The fin rays are as follows: — D. 11. P. 14. V. 9. A. 15. C. 19.

Length, three to ten inches.

Remarks. This beautiful species is brought to Boston market in the spring and autumn in large quantities, and is highly esteemed as an article of food. In the spring it is taken in nets up the rivers, and in winter with the hook beneath the ice. In Watertown alone, about 750,000 dozen are taken annually in scoop-nets, from the first of March to the first of June. The largest specimens I have seen were taken in Milton River in the latter part of December, 1837. Four specimens taken, without regard to size, weighed one pound and a half.

Maine, Massachusetts, LESUEUR, STORER. New York, MITCHILL, DEKAY. "From the waters of Huron to the coast of Labrador," DEKAY.

GENUS III. SCOPELUS, Cuv.

Body long, slender; the principal dorsal fin over the interval between the ventral and anal fins; a second dorsal, so small as to be scarcely perceptible. The head short; the mouth and gill-aperture large; small teeth on both jaws; palate and tongue smooth.

SCOPELUS HUMBOLDTII, Cuv.

The Argentine.

(PLATE XXV. FIG. 5.)

Argentina sphyraena, *Argentine*, PENN., Brit. Zoöl., III. p. 286, fig.

Scopelus Humboldtii, CUV., AN. KING, Eng. edit., x. p. 432.

" " YARRELL, Brit. Fish., 1st edit., II. p. 94, fig.; 2d edit., II. p. 161, fig.

" " *The Argentine*, STORER, Report, p. 110.

" ? " DEKAY, Report, p. 246.

" " STORER, Mem. Amer. Acad., New Series, II. p. 450.

" " " Synopsis, p. 198.

" " CUV. et VAL., Nat. Hist. des Pois., XXII. p. 431.

Color. Back, to depth of a line, dark brownish-green. Sides, opercula, and beneath orbit silvery, as also irides. A row of large circular golden spots on a bluish-metallic

ground, five in number, runs along each side of the throat. A similar row of twelve, somewhat smaller in size, on each side of the belly from before pectorals to ventrals. Above these, on the sides, another row of eight, still smaller ones, between base of pectorals and a point perpendicularly over ventrals; between ventrals and anal, five; above anus, one, breaking the row, which is continued from the anus to base of tail by a series of twenty-four, gradually decreasing in size to a mere speck; about two thirds this distance, a single spot omitted on each side.

Description. Body compressed, elongated. Its depth, which to near the ventrals is equal, is about one fourth the whole length, and about the length of the head, of which the diameter of the large eye is but little less than one third. Nostrils double, situated just anteriorly to upper edge of orbit. Mouth widely cleft, its gape transverse, lower jaw being much the longer when expanded. Lateral line nearly straight for the posterior two thirds, and about midway of the body; in its anterior third, rising to upper third of operculum; almost imperceptible.

Dorsal situated at about the middle of the back, on a line between the ventrals and anal; moderate in size.

The adipose fin about equidistant from dorsal and caudal; hardly perceptible; apparently little more than a membranous ridge.

Pectorals much elongated; their rays gradually increasing in length upwards and outwards.

Ventrals and anal small, and situated very near each other.

Caudal deeply forked.

The fin rays are as follows: — D. 10. P. 17. V. 8. A. 15. C. 19.

Length of specimen of 1856, one inch and six lines; of that of 1837, two inches and one line.

Remarks. In December, 1837, I received from Mr. Jonathan Johnson, of Nahant, a specimen of this fish, which he had just previously found alive on the beach at that place. Although a fisherman from his youth, he had never seen a living specimen before, but he had repeatedly found partially decomposed specimens in the stomachs of haddock.

Several years afterwards, my son, Horatio R. Storer, found a mutilated specimen in the stomach of a cod at Provincetown.

Captain Atwood brought me a specimen in July, 1856, which had been found alive a few days before upon the beach at Provincetown. This specimen has enabled Mr. Sonrel to furnish me with a figure, and allowed me to redescribe the species. Our fish agrees almost precisely with the very thoroughly and carefully drawn description

given by Dr. Clarke, in Yarrell's "British Fishes," from a specimen taken in 1833, in the Frith of Forth, and there can be little doubt of their identity.

Soon after I had received my specimen from Provincetown, Captain Atwood found five other individuals alive on the beach at that place.

FAMILY XVII. CLUPEIDÆ.

No adipose fin. The upper jaw is formed as in the Trout, at the middle by intermaxillaries, without pedicles, and on the sides by the maxillaries. Their body is always very scaly.

GENUS I. CLUPEA, CUV.

Body compressed; scales large, thin, and deciduous. Head compressed; teeth minute or wanting. A single dorsal fin. Abdominal line forming a sharp, keel-like edge, which in some species is serrated; branchiostegous rays, eight.

CLUPEA ELONGATA, *Lesueur*.

The Common American Herring.

(PLATE XXVI. FIG. 1.)

Clupea harengus, *Herring of Commerce*, MITCHILL, Amer. Month. Mag., II. p. 323.

Clupea elongata, LESUEUR, Journ. Acad. Nat. Sc., I. p. ~~250~~ 234.

" " *Common Herring of Massachusetts*, STORER, Report, p. 111.

" " *Common American Herring*, DEKAY, Report, p. 250.

" " STORER, Mem. Amer. Acad., New Series, II. p. 456.

" " " Synopsis, p. 204.

Le Hareng de New York (*Clupea elongata*, LESUEUR), CUV. et VAL., XX. p. 247.

Color. Above, of a deep blue tinged with yellow; sides silvery, with metallic reflections; opercles brassy, with metallic reflections; beneath, silvery. Pupils black, irides silvery.

Description. Body elongated, fusiform, compressed. The depth of the fish at the origin of the dorsal fin is equal to one sixth its entire length; its width, at the commencement of the dorsal, is about one twelfth its entire length. The scales are large, silvery, nearly smooth, deciduous. The abdominal ridge is indistinctly serrated. About thirty serrations are seen in front of, and fifteen back of, the ventrals. The length of the head, when the mouth is closed, from the extremity of the chin, is equal to about one sixth of the entire length; head naked, with a depression above, extending from occiput anteriorly, exhibiting numerous mucous pores. Teeth on lower jaw, vomer, and

centre of tongue. Vertical gape of mouth equal to half the length of the head. Eyes large, circular, provided with a nictitating membrane; distance between the eyes less than the diameter of the eye. Nostrils situated in a groove, nearer the snout than the eyes.

The subquadrangular dorsal fin arises on the anterior half of the body.

The fan-shaped pectorals are one third as long as high.

The ventrals are situated opposite the dorsal, and are two thirds as high as that fin.

The anal fin is about as long as the dorsal; its first rays are one third as high as its length.

The caudal fin is deeply forked; scales are continued upon the base of its rays.

The fin rays are as follows: — D. 18. P. 19. V. 9. A. 17. C. 22.

Length, twelve to fifteen inches.

Remarks. This species, incorrectly called by our fishermen "English Herring," is taken in great numbers on some parts of our coast. At Edgartown, it is abundant from March to May; on the south side of that place, sometimes five hundred or six hundred barrels are taken in a single night. These are sold fresh, salted, or smoked. When it first makes its appearance, it is sold to fishing-smacks for \$1.50 per hundred for bait; when it is abundant, it does not sell, for the same purpose, for more than twenty-five cents per hundred. When salted, it brings three dollars per barrel.

Until within the last twenty years, this species was exceedingly abundant at Cape Cod. It came into Massachusetts Bay and Provincetown harbor in myriads from about the 20th of March to the 1st of April, and continued there until June, and would then leave the coast and not be seen again until the autumn. Now, it has become so rare that at some seasons it is scarcely seen at all. Within the last few years, it is perhaps slightly increasing. While I was visiting Race Point, Provincetown, June 25th, 1847, the crews of two boats captured with sweep-nets, the one a hundred and fifty barrels, the other thirty-five barrels, of full-sized herring. They had never been known to be taken at that season, but are generally captured there early in May. They would sell for one dollar per barrel for bait, and two dollars per barrel salted. The nets by which they are taken are carried out in boats a short distance from the shore, and when a school of fish make their appearance, they are thrown overboard outside of the fish, and thence drawn towards the shore, forcing the fish forwards into shoal water. The young of this species are called *Spirling*, and serve as excellent bait for codfish. They are taken in nets which are about forty yards long and fifteen feet deep, with meshes an inch and a half across. Within the last few years these young fishes, which in the fall of the year are three or four inches long, have been met

with in increased numbers ; they disappear during the unpleasant weather in November. At George's Banks, these immature fishes are not found ; there, the herring are full grown.

In different portions of Massachusetts Bay the herring has been taken by "torch-ing"; and it is the opinion of many intelligent fishermen, that this method of capturing them has been one of the means of their being less frequent upon our coast than they were formerly. They are thus taken. A large torch is attached to the bows of the boat, which is rowed very fast ; the fish, attracted by the light, follow the boat, and with a dip-net are caught in large numbers.

The *Clupea minima*, PECK, is undoubtedly the young of this fish. They are found from half an inch to over a foot in length. When half grown they are called Spirling, and are much sought for cod-bait, being preferred to anything else by all fish. A man can frequently catch many fish with these when he has not had a bite with clams and mussels.*

Massachusetts, LESUEUR, STORER. New Hampshire, PECK. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

GENUS II. ALOSA, CUV.

Upper jaw with a deep notch in the centre ; in other respects like the *Clupea*.

ALOSA PRÆSTABILIS, *Dekay*.

The American Shad.

(PLATE XXVI. FIG. 2.)

- Clupea sapidissima*, WILSON, Rees's Encyclopæd. (Amer. edit.) ; catalogued, but not described.
 " " RAF., Amer. Month. Mag., II. p. 205.
Clupea alosa, *Shad*, BELKNAP, Hist. New Hampshire, III. p. 130.
 " " " MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 449.
Clupea indigena, *Sprat Herring*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 454 (young).
Alosa vulgaris, *Common Shad*, STORER, Report, p. 116.
Alosa præstabilis, *American Shad*, DEKAY, Report, p. 255, pl. 15, fig. 41.
Alosa sapidissima, *Shad*, LINSLEY, Cat. of Fishes of Connecticut, Silliman's Journal, XLVII.
 " " STORER, Mem. Amer. Acad., New Series, II. p. 458.
 " " " Synopsis, p. 206.
L'Alose savoureuse, *Alausa præstabilis*, CUV. et VAL., XX. p. 421.

Color. The upper portion of the sides, including the opercula, cupreous ; the lower portion of the sides silvery, with a greenish tinge ; the abdomen is pearly ; the top of

* Although the young of this species is so acceptable to the cod and haddock, yet they will not touch young alewives, nor in fact any fish that is spawned in fresh water.

the head and back bluish. At the posterior angle of the operculum is a black blotch of considerable size, which in some specimens is very indistinct until the scales are removed, when it is obvious. Pupils black, irides silvery. The dorsal fin is transparent; the tips of its rays are tinged with brown. The pectorals are silvery; their outer rays are fuliginous beneath. The ventrals are of the same color as the abdomen.

Description. Body oblong, compressed. Covered throughout with large deciduous scales, with the exception of the head, which is naked. Head equal in length to one sixth of the entire fish; the greatest depth of the body exceeds the length of the head. The upper jaw is notched in its centre; its lateral edges are slightly crenated. The eyes are large; the diameter of the eye is less than half the distance between the eyes. The nostrils are nearer to the anterior angle of the eye than to the snout. The abdominal ridge is serrated throughout, from the inferior angle of the operculum to the anus; the serrations are more prominent back of the ventrals.

The quadrangular dorsal fin, which shuts into a groove, is situated on the anterior half of the body; the height of the first rays is equal to two thirds the length of the fin. The first rays are simple; the succeeding, multiradial; the fourth and fifth rays are longest.

The length of the pectorals is equal to about one third of their height; all the rays except the first, which is simple, are bifid.

The triangular ventrals are situated opposite the middle of the dorsal fin. They have at their base, on each side, a large accessory scale.

The anal fin is low, emarginated above, and, like the dorsal, is partially received into a groove when not erected; its fourth ray, which is highest, is less than one sixth the length of the fin.

The caudal fin is deeply forked; at the base of each lobe is a patch of small scales. At the base of this fin are two membranous appendages, one on each side of its centre.

The fin rays are as follows:—D. 17 to 19. P. 16. V. 9. A. 20 to 22. C. 20.

Length, twenty inches.

Remarks. In my "Synopsis of the Fishes of North America," I adopted Wilson's scientific name of this species. As, however, a name was merely proposed by him, and no description given, I feel that to him belongs the honor who first presented an accurate description at the same time that he considered it a new species. I therefore accept Dr. Dekay's as more appropriate.

In the spring of the year, this excellent fish is brought to Boston market from the mouths of the neighboring rivers in considerable quantities, and meets with a ready sale. At first they sell for fifty cents apiece; as the season advances, for twenty-five

cents, and at last may be bought for about twelve cents. Many of this species are packed and inspected. In the year 1832, 100 barrels were inspected; in 1833, 321; in 1834, 3; in 1835, 310; in 1836, 527; in 1837, 652; in 1838, 390; in 1839, 773; in 1840, 856; in 1841, 3,910; in 1842, 513; in 1843, 903; in 1844, 1,679; in 1845, 1,338; in 1846, 517; in 1847, 474; in 1848, $228\frac{3}{4}$; in 1849, 415; in 1850, 705; in 1851, $180\frac{3}{4}$; in 1852, 195; in 1853, $16\frac{5}{8}$; in 1854, $225\frac{3}{8}$; in 1855, $238\frac{1}{2}$; in 1856, 265; in 1857, $473\frac{1}{2}$.

The quantities taken in Charles River, at Watertown, for the five years preceding 1838, averaged about 6,000 per annum. From 3,000 to 4,000 are yearly caught at Taunton. Sixty years ago this fish was very scarce in the Merrimack River, and remained so for about five years; previous to that time they had been very abundant, and it is said that 10,000 were caught at one haul. After the scarcity they became again abundant, and continued so till about the year 1810, when they were again scarce for two or three years. They then became plentiful, and still continue so. This species goes up the river during the whole of May. Its greatest run is when the apple-trees are in full blossom. The old shad return in August; the young, three or four inches long, in September. It is said that the Concord River water is warmer than that of the Merrimack, and that Concord shad were caught a month earlier than those of the Merrimack above its junction with the Concord. The Concord shad have almost entirely disappeared, their ascent being cut off by dams.

Maine, Connecticut, LINSLEY. New Hampshire, BELKNAP. Massachusetts, STORER. New York, MITCHILL, DEKAY. South Carolina, Virginia, DEKAY.

ALOSA TYRANNUS, *Dekay*.

The Alewife.

(PLATE XXVI. FIG. 3.)

Clupea serrata, PECK, Belknap's Hist. of New Hampshire, III. p. 133.

Clupea tyrannus, Bay Alewife, LATROBE, Amer. Phil. Soc. Trans., v. p. 77, pl. 1.

Clupea vernalis, Spring Herring or Alewife, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 454.

Alosa vernalis, Spring Herring or Alewife, STORER, Report, p. 114.

Alosa tyrannus, American Alewife, DEKAY, Report, p. 258, pl. 13, fig. 38.

Alosa vernalis, LINSLEY, Cat. of Fishes of Connecticut, Silliman's Journal, XLVII.

Alosa tyrannus, STORER, Mem. Amer. Acad., New Series, II. p. 459.

“ “ “ Synopsis, p. 207.

L'Alose tyran, *Alosa tyrannus*, CUV. et VAL., Hist. Nat. des Pois., XX. p. 419.

Color. Back, bluish purple; sides more or less cupreous; beneath silvery and beautifully iridescent. Four or five, and sometimes even more, indistinct greenish-brown

longitudinal lines extend from the operculum to the tail. These lines are much more clearly seen when the fish is looked at from either extremity, the eye being placed on a line with the fish. The opercula are cupreous, and marked by numerous vessels, which give them a beautiful arborescent appearance.

Description. Body elongated, compressed. The head is about one sixth the whole length of the fish; the depth of the fish at the origin of the dorsal fin is rather less than one fourth its entire length. Eyes large; their diameter equal to one fourth the length of the head. Pupils black, irides silvery. Mouth very large. The upper jaw notched at its centre; the lower jaw slightly the longer; the intermaxillaries very protractile. Jaws edentate. Nostrils large, situated just back of the snout. Back of the posterior angle of the operculum, upon the shoulder, is a deep black blotch. The scales are very large and deciduous, marked with concentric striæ. The entire abdominal edge is strongly serrated with projecting bony spines; these serrations are larger back of the ventrals, between them and the anus.

The dorsal fin is quadrangular, slightly longer than high.

Height of the pectorals a little greater than the length of the dorsal fin.

The ventrals are very small.

The anal fin is low, slightly emarginated, and equal in length to the dorsal fin.

The caudal fin is deeply forked.

The fin rays are as follows: — D. 18. P. 15. V. 9. A. 18. C. 21.

Length, eight to twelve inches. Weight, about half a pound.

Remarks. In several portions of the State, where the alewife was formerly most abundant, the various encroachments of man have sensibly diminished its numbers; it is still, however, in some places taken in immense quantities. In Taunton, the fishermen commence taking it the last of March or the first of April, and continue to take it until the middle or the last of May, at which time it has so much diminished in numbers, and has become so inferior in its quality, that the business is not a lucrative one. The last of the *run* are of a very small size, and are called "Black-bellies."

At Watertown, the average quantity of alewives taken, for the two years preceding 1839, was seven hundred barrels.

They are first pickled, then salted and barrelled, and sent to the West Indies. They sell for from \$1.50 to \$2 per barrel. At Taunton, which was at one time so celebrated for its fishery, the alewives are gradually lessening. Forty years since, they were taken in such abundance at Taunton that they sold for twenty cents per hundred, and a great business was carried on in barrelling and shipping them to the West Indian market. At the present time, when first taken, they sell for one dollar per hundred;

and, as the season advances, diminish gradually in price to fifty cents. Most of the fish are disposed of at the seines (fresh), and cured by the purchasers. Two or more dams across the "Great River," at Taunton, impede the progress of this species very much; and on the "Little River," where many dams and factories have been erected, and where forty years ago thousands were taken, not one is now to be seen. In the Merrimack River, too, they have been diminishing in numbers for the last twenty years; the fishermen think this is owing to the small ponds emptying into the river having been dammed up. A pond in Manchester and Chester was formerly famous for its alewives. At some seasons, large quantities are taken in Mystic River; thus, fifty thousand were taken at one haul at Medford, in April, 1844.

A larger quantity of alewives is packed than of any other species of this family. In 1832, 1,730 barrels were inspected; in 1833, 2,266; in 1834, 4,320; in 1835, 5,600; in 1836, 5,000; in 1837, 1,182; in 1838, 604; in 1839, 2,769; in 1840, 1,474; in 1841, 2,840; in 1842, 3,580; in 1843, 5,554; in 1844, 6,380; in 1845, 4,714; in 1846, 2,626½; in 1847, 3,843; in 1848, 1,899¼; in 1849, 2,189; in 1850, 1,629; in 1851, 1,358½; in 1852, 1,604; in 1853, 1,580; in 1854, 1,645; in 1855, 2,775; in 1856, 2,740½; in 1857, 2,497.

New Hampshire, PECK. Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY. Chesapeake Bay, MITCHILL.

ALOSA MENHADEN, *Storer*.

The Menhaden.

(PLATE XXVI. FIG. 4.)

Clupea menhaden, *Bony-fish*, *Hard-heads*, or *Marsh-bankers* of New York, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 453, pl. 5, fig. 7.

Alosa menhaden, *Menhaden*, *Hard-head*, STORER, Report, p. 117.

" " *Moss-bonker*, DEKAY, Report, p. 259, pl. 21, fig. 60.

" " AYRES, Bost. Journ. Nat. Hist., IV. p. 275.

" " STORER, Mem. Amer. Acad., New Series, II. p. 459.

" " " Synopsis, p. 207.

L'Alose menhaden, *Alausa menhaden*, CUV. et VAL., Hist. Nat. des Pois., XX. p. 424.

Color. Upper part of body of a greenish-brown, darker upon the top of the head and at the snout; upper part of the sides in the living fish roseous, and mottled with indistinct bluish oscillations, which disappear in death; abdomen silvery; gill-covers cupreous, with a rosy tint; space in front of the eyes translucent; a black spot, more or less distinct, upon the shoulders; whole surface of the fish iridescent.

Description. Body elongated, compressed. Its depth across, at the base of the pectorals, less than one fifth the length of the fish. Length of the head more than one third the length of the fish. Gill-covers very large. Opercula with numerous deeply-marked striae, which commence just beneath a large green blotch, situated some distance back of the eye and on a line with it, and pass obliquely backwards and downwards to its lower edge; subopercula and interopercula smooth; preopercula presenting an arborescent appearance of vessels upon their surface. Eyes circular, moderate in size, furnished with a nictitating membrane. Gape of mouth very large; lower jaw shorter than the upper; the middle of the upper jaw deeply emarginate. Back slightly arched in front of the dorsal fin.

The dorsal fin commences upon the anterior half of the body; it is nearly as long again as high, and is emarginated above; at its base is a membranous prolongation or sheath, by which it is almost entirely covered when unexpanded. The first three rays of this fin are simple; the first articulated rays are higher than the remainder, the most posterior higher than the eight or nine preceding.

The pectorals are situated just beneath the posterior inferior angle of the operculum; the first three rays are the longest; the first ray is simple. Outside of this fin is an axillary plate, more than two thirds the length of the fin; a broad scaly shield at the base of the pectorals covers a portion of the inferior edge.

The ventrals are very small, and fan-shaped; their rays are multifold; on each side of these fins is an axillary plate.

The anal fin is shorter than the dorsal, low, and slightly emarginated above; its anterior rays are highest; the first ray is simple; it is sheathed at its base, like the dorsal.

The caudal fin is deeply forked; the depth of the fin at its extremities, when expanded, is equal to the height of the outer rays.

The fin rays are as follows:—D. 19. P. 15, 16, or 17. V. 6. A. 20, 21, or 22. C. 20 $\frac{1}{4}$.

Length, eight to fourteen inches.

Remarks. This valuable species comes into Massachusetts Bay about the middle of May, and leaves it in November; and is taken in immense quantities for the various uses to which it is appropriated, viz. bait for other fishes, manure, oil, and food.

The fishermen who supply Boston market with codfish set their nets about the outer islands in the harbor each night as they come up to the city, and examine them in the morning as they go out for the day's fishing. Large numbers are thus taken, frequently one hundred barrels at a haul, and such as are not used as bait are sold to the poorer classes for food, at about six and a quarter cents per dozen. It is not very pal-

atable, having an oily or muddy taste. It is also considered a very good bait for halibut. At Provincetown, this species is used only for mackerel bait; and for this purpose they are worth from seventy-five cents to four dollars per barrel, in proportion to the demand. In the year 1836, 1,500 barrels were used as bait for other fishes. While I was visiting Race Point, in the latter part of June, 1847, a large number of barrels of this fish were taken by the fishermen in their sweep-nets from the shore. I learn from Captain Atwood, that a much smaller number are taken in the sweep-nets than formerly, as they stay off in deeper water, for the most part out of reach of the nets, and but few are caught in the mackerel nets.

Being a very oily fish, it is valuable as an article of manure. In some places they are taken for this purpose only. At Lynn, in 1836, 1,500 barrels full were thrown upon the land. At Sandwich, where they are very abundant, the inhabitants strew them upon their land by the cart-load, and thus for miles immense quantities enrich the soil. It is computed that a single menhaden, of ordinary size, is equal in richness to a shovelful of barn-yard manure. Upon some portions of Cape Cod, menhaden are sold to the farmers for one dollar per thousand for manure; they average about one pound each, and twenty-five hundred are considered a proper quantity for an acre.

Dekay states, that in the counties of Suffolk, King's, and Queen's, in New York, it is used as an article of manure in the following ways: — "For Indian corn, two or three are thrown on a hill; for wheat, they are thrown broadcast on the field and ploughed under, although it is not uncommon to put them in layers alternately with common mould, and when decomposed to spread it like any other compost. Its effects in renovating old grass-fields, when spread over with these fish at the rate of about two thousand to the acre, are very remarkable."

That the air, however, must be exceedingly deteriorated, if not rendered decidedly unhealthy by them, is shown by the following extract of a letter from my friend, J. B. Forsyth, M. D., formerly of Sandwich, now of Chelsea, dated November 8th, 1837. "For two or three miles below me, on the Barnstable road, the stench from the decomposing fish was a great nuisance to travellers passing along the road, so much so that I feared they might be instrumental in the production of disease; but whether they were so or not, I am not now prepared to say. But certain it is, there have been more cases of autumnal fever and dysentery this season in this district, than in all the rest of the town."

It is also taken for its oil. In the year 1845, four or five hundred barrels of oil were obtained at the Elizabeth Islands, by grinding up these fishes by machinery. This oil is used by the painters, and is considered preferable to linseed oil.

Within a few years numbers have been packed and inspected for exportation as an article of food. In 1832, 300 barrels were inspected; in 1833, 480; in 1834, 1,008; in 1835, 1,443; in 1836, 1,488; in 1837, 461; in 1838, 1,164; in 1839, 1,083; in 1840, 1,427; in 1841, 2,138; in 1842, 566; in 1843, 854; in 1844, 476; in 1845, 272; in 1846, 585; in 1847, 132; in 1848, 137; in 1849, 78; in 1850, 137; in 1851, 0; in 1852, 107; in 1853, 0; in 1854, 0; in 1855, 0; in 1856, 63; in 1857, 203.

This species is much more numerous along our coast in some years than in others; thus, in the year 1845 they might readily be purchased for from twenty to thirty cents per barrel, while in 1847 the fishermen would willingly have offered one dollar per barrel.

Maine, Massachusetts, STORER. Connecticut, AYRES, LINSLEY. New York, MITCHELL, DEKAY.

ALOSA CYANONOTON, Storer.

The Blue-back.

(PLATE XXVII. FIG. 1.)

Alosa Cyanonoton, STORER, Proc. Bost. Soc. Nat. Hist., II. p. 242.

Color. Above bluish, cupreous upon the sides and the opercula; silvery beneath. When the large deciduous scales are removed, the entire upper portion of the body is of a deep greenish-blue color. A large, circular black spot exists just back of the posterior angle of the operculum; the opercula present a beautiful arborescent appearance. Pupils black, irides golden.

Description. Body stout, elongated. The abdominal ridge is serrated, the serrations being stronger back of the ventrals. Twenty serrations exist anterior to, and fifteen back of, the ventrals. The length of the head is less than one fifth the length of the body; the greatest depth of the fish is equal to about one fourth the length of the body. The jaws are equal. The eyes are moderate-sized and circular. The nostrils are large, near the snout.

The dorsal fin arises on the anterior half of the body; it is quadrangular, and emarginated above.

The pectorals are falciform, and equal in height to the length of the dorsal, with accessory plates at their base.

The ventrals are fan-shaped, and have accessory plates.

The anal fin is low, and longer than the dorsal.

The caudal is deeply forked, and has at its base two membranous pouches.

The fin rays are as follows: — D. 17. P. 18. V. 10. A. 17. C. 20.

Length, ten inches.

Remarks. This species is called "Blue-back" and "Kiouk," by the fishermen at Provincetown. It is seldom met with more than ten inches in length. A few make their appearance in May; they are then quite small and scattered; they are numerous before the 10th of June. They are occasionally taken, in small numbers, in mackerel-nets; but few only are thus captured, as their size allows them to swim through the meshes of the net. They remain along the coast for only a short time. Some years since, they were found in much larger numbers than at present, and a hundred barrels full of them would be taken at the drag of a net. They are used as bait for mackerel, and are worth about a dollar a barrel for that purpose. Captain Atwood thinks this species is never found in rivers.

This fish is very fat, almost too much so to eat; and, appearing at a season when other favorite species are so common, no use is made of it as an article of food.

Massachusetts, STORER.

ALOSA LINEATA, Storer.

The Hickory-Shad.

(PLATE XXVII. FIG. 2.)

Alosa lineata, STORER, Proc. Bost. Soc. Nat. Hist., II. p. 242.

Color. The sides of this fish are silvery, with six or eight indistinct bluish bands running from the head to the tail, which are light-colored after death. The opercula are cupreous; the pectoral and caudal fins are of a dark-brown color, the pectorals being fuliginous beneath; the anal and ventral fins are nearly white.

Description. Body elongated, compressed. The head is equal in length to about one fifth the entire fish; the lower jaw is the longer; the chin is prominent; the eyes are large and circular, their diameter equal to about one sixth the length of the head; the space between the eyes, from the nostrils to the occiput, is translucent. The opercula and preopercula are beautifully striated; the interopercle is but slightly roughened. The abdomen is serrated; about fifteen serrations between the ventral and anal fins, more strongly marked than those anterior to the ventrals. The scales are large and rounded; their concealed portion is covered with concentric striæ, and delicate radiations are seen passing to their circumference upon their exposed portions.

The dorsal fin arises upon the anterior portion of the body; its height is equal to two thirds its length.

The pectorals are rather higher than the length of the dorsal fin ; at their base, they have on each side a broad axillary plate, concealing a considerable portion of their extent.

The ventrals arise opposite the anterior portion of the dorsal ; they have at their bases, also, axillary plates.

The anterior portion of the anal fin is as high again as the posterior portion ; it is rather longer than the dorsal fin.

The caudal fin is deeply falcate ; the scales are continued high up on its central rays, which are transparent and exceedingly delicate ; the rays are articulated. Caudal pouches.

The fin rays are as follows : — D. 17. P. 16. V. 8. A. 20. C. 20.

Length, fifteen inches.

Remarks. This species, which does not appear in great numbers, is known at Provincetown by the name of "Hickory-Shad." It is taken in nets while fishing for mackerel, in May and June. It is a lean fish, and is not used for food.

Massachusetts, STORER.

GENUS III. ENGRAULIS, Cuv.

Body rounded or compressed. Mouth large ; snout protruded beyond the lower jaw. Intermaxillaries very small, and hidden under the snout ; maxillaries slender, stretching over the cheeks ; a few teeth on front of the vomer ; palatine and pterygoidian teeth sometimes reduced to mere asperities. Gill-openings very large, and continuous under the throat. Branchiostegal membrane narrow, and hidden under the jaw ; its rays being short, and variable in number. Caudal fin forked. Dorsal fin rather small. Insertion of pectorals near the gill-openings. Ventrals very small.

ENGRAULIS VITTATA, B. and G.

The American Anchovy.

(PLATE XXVII. FIG. 3.)

Clupea vittata, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 456.

Clupea cærulea, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 457.

Clupea vittata, DEKAY, Report, p. 254.

" " STORER, Mem. Amer. Acad., New Series, II. p. 457.

" " " Synopsis, p. 205.

Clupea cærulea, DEKAY, Report, p. 254.

" " STORER, Mem. Amer. Acad., New Series, II. p. 457.

" " " Synopsis, p. 205.

Engraulis Mitchilli, VAL., Cuv. et VAL., Nat. Hist. des Pois., XXI. p. 50.

Engraulis vittata, B. and G., Smithsonian Institution's Ninth Annual Report, p. 33.

Color. Top of the head bluish-slate; back light-green, dotted with fuliginous. A greenish-blue stripe high up on the side, shadowed out on the head from the upper orbit of the eye, more defined above the posterior opercle, and thence extending nearly to the tail. Sides below greenish-silvery, with metallic reflections. Gill-covers and abdomen silvery, with nacreous iridescence.

Description. Outline of the body ascending from the tip of the snout to the origin of the dorsal fin, thence descending in an equal curve; hence, the dorsum is regularly gibbous, while the thoracic and the abdominal plane is nearly straight, or with a slight double curve; convex anteriorly, concave posteriorly. Head elongated, sharp, wedge-shaped; broad above posteriorly, attenuated below. Length of the head one fifth the length of the body, and a third longer than the greatest depth of the body; its greatest width above, one third its length; its width below, a mere line. Eyes large, situated on the anterior third of the head; their diameter is equal to two thirds of the distance between them. Jaws unequal; the upper much the longer, and nearly concealing the lower, which shuts into it as into a groove; jaws armed with very minute teeth. Gill-covers elongated, yet rounded. Scales very large and deciduous.

First dorsal commencing just anterior to the median line; its first ray the longer; subquadrangular.

Pectorals rather small, situated low, and just posterior to the opercula, with an elongated scapular scale at the base; this is nearly its own length.

Ventrals commence a little anterior to a perpendicular from the commencement of the dorsal fin. The basic iliac scale is also elongated, and nearly its own length.

Anal about as far posterior to the ventrals as these were to the pectorals; about twice the length of the dorsal.

Caudal fin deeply forked.

The fin rays are as follows:—D. 8. P. 17. V. 5. A. 14. C. 18.

Length, three and a half inches.

Remarks. A fine specimen of this species was brought to me in November, 1852, from Provincetown, by Dr. Charles Girard, now of Washington, D. C. I have retained the specific name originally given it by Mitchill, and very properly affixed by Girard, although Valenciennes has thought proper to change it.

Mr. Baird, in his "Report to the Secretary of the Smithsonian Institution on the Fishes of the New Jersey Coast, as observed in the Summer of 1854," remarks that "the Anchovy made its appearance early in August, in the shallow waters along the beach, although of very small size. They became subsequently more abundant; and towards the end of the month, while hauling a large net in the surf, many were taken

measuring over six inches in length. As the meshes of the net were very large, the greater portion readily escaped ; but with a seine properly constructed, enough could be readily procured to supply the American markets."

Massachusetts, STORER. New York, MITCHILL, VALENCIENNES. New Jersey, BAIRD.

JUGULARES.

Ventrals attached under the pectorals, and the pelvis immediately suspended to the bones of the shoulder.

FAMILY XVIII. GADIDÆ.

Body elongated, but little compressed, covered with soft scales not very voluminous. The head well-proportioned, and without scales. All their fins soft. The jaws and the front of the vomer are armed with pointed, irregular teeth, middling or small-sized, in several rows, forming a sort of currycomb or rasp ; their gills are large, with seven rays. Ventrals separate, jugular. Almost all have two or three fins on the back, one or two behind the anus, and a distinct caudal. Their stomach is in the form of a large and strong sac ; their cœca are very numerous, and their caudal tolerably long. They have a large air-bladder, with strong parietes, and frequently dentated in the sides.

GENUS I. MORRHUA, Cuv.

Three dorsal fins ; two anal ; ventrals pointed. A barbel at the end of the lower jaw.

MORRHUA AMERICANA, Storer.

The American Cod.

(PLATE XXVII. FIG. 4.)

Gadus callarias, Common Cod of New York, MITCHILL, Trans. Lit. and Phil. Soc. of N. Y., I. p. 367.

Morrhua Americana, American Cod, STORER, Report, p. 120.

" " DEKAY, Report, p. 274, pl. 44, fig. 140.

" " STORER, Mem. Amer. Acad., New Series, II. p. 467.

" " " Synopsis, p. 215.

Color. An individual twenty-eight inches in length presents the following appearances. Back ash-colored ; sides lighter ; back, sides, and part of the head covered with yellowish spots, which are rather larger and more distinct upon the sides ; beneath, dusky-

white. Pupils black ; irides a beautiful silver. All the dorsal fins are of a greenish-blue color, and spotted, like the body. The ventrals, as well as the anals, are rather darker than the abdomen. The caudal is spotted like the rest of the body.

The color of this species is very variable. In the same stall in our market may frequently be seen specimens with equally obvious spots over their entire surface ; or they may be much more perceptible on the sides ; or they may be scarcely observed at all, and the entire fish appear of a uniform gray ; or, again, of a beautiful bright-red ; and I have seen a single specimen which was of a lemon-yellow.

Description. The greatest depth of the body is nearly equal to one fifth its length ; the length of the head is equal to one fourth the entire length of the fish ; the distance of the extremity of the snout from a line on a plane with the anterior angle of the eye, is nearly equal to one third the length of the head ; diameter of the eye equal to one sixth the length of the head ; the distance between the eyes is nearly equal to one third the length of the head. Nostrils double, the posterior lower and larger. The upper jaw projects beyond the lower. In the lower jaw are two rows of teeth ; those of the larger row, which are in the back part of the jaw, are larger and incurved ; while those in the fore part of the jaw are much smaller. In the upper jaw are several rows of card-like teeth, of which the outermost is much the largest. There are teeth on the vomer and pharyngeal bones. A single barbel, about an inch long, upon the chin. The lateral line, arising above the operculum, makes a very gradual slope upwards, and as gradually curves downwards, until, opposite the anterior third of the second dorsal, it commences a straight course, which is continued to the tail ; this line, which is lighter-colored throughout its whole extent than the body, is wider and more conspicuous after assuming a straight course.

The first dorsal fin arises just back of the pectorals ; the second dorsal is much longer, and the third is but little longer, than the first.

The pectorals are rounded ; their length is nearly equal to half their height.

The ventrals are situated in front of the pectorals ; their two outer rays are free, the second being the longer.

The first anal fin is about equal in length to the second dorsal ; the second anal is much the shorter.

The height of the caudal fin is about twice its length.

The fin rays are as follows : — D. 14, 21, 21. P. 18. V. 6. A. 14, 19. C. 38. In another specimen, — D. 15, 22, 19. P. 19. V. 6. A. 22, 19. C. 40.

Length, two to eight feet.

Remarks. The great value of the cod-fishery to the State of Massachusetts requires

that I should offer here something more than a few cursory observations. Among the earliest enterprises undertaken in New England, it has at all times been zealously prosecuted and liberally encouraged ; those engaged in it have always been among our most industrious, respectable citizens, and its existence and prosperity have ever been a subject of State pride. The rise, progress, extent, and value of this fishery are full of interest, and I shall offer no apology for presenting the following valuable article, by Benjamin W. Hale, Esq., of Newbury, from the "Newburyport Herald" of February 12, 1840.

"The commencement of this fishery takes its date prior to the landing of the Pilgrim Fathers, and it is believed to be the first, if not the only business, the prosecution of which they encouraged by a bounty.

"The first fishing company in New England was established at Gloucester in 1624, which continued its operations but two years. It was, however, incorporated as a fishing plantation in 1639, and that the early operations in this branch of business were successful appears evident, as its products are mentioned as forming the first of four articles of export as early as 1655, and in 1668, when the trade of the Colony was represented as being in a very flourishing condition, there being upwards of one hundred and thirty vessels, of all descriptions, owned in the Colony, it was assigned the first place in the list of exports to the West Indies and Europe, and was considered the most lucrative branch of industry carried on in the Colony.

"In a report of the commerce and resources of the Colony, in 1763, the number of vessels of all classes employed in this business is stated to be three hundred sail, and its products still occupy the first place on the list of exports to the West Indies and Europe.

"The principal ports in Europe to which shipments were made, were those in the Bay of Biscay, Cadiz, and Lisbon. This trade was prosecuted for several years, before and after the war of the Revolution, so extensively from Marblehead (their operations being confined to the Grand-Bank Fishery, the products of which were suitable for those markets), that they not only shipped what was cured in that town, suitable for those markets, but purchased from other ports in the State.

"The increase of business was rapid after the peace, from the encouragement of a bounty granted by government ; and from the representations of some Nova Scotia fishermen, who settled in this district and prosecuted the salmon-fishery on the coast of Labrador, a vessel was fitted out in 1799 for cod-fishing, which was the first attempt from the United States on that coast. This voyage proving successful, one or two others fitted out the next year ; and the success attending these operations encouraged others to engage in the business. Discoveries were extended, and new fishing-grounds explored, so that, in 1807, four vessels from Newburyport (the first from the United

States), took their fares in Esquimaux Bay ; and the increase of the business was such, that, the season the attack on the Chesapeake frigate took place, upwards of forty vessels were employed on that coast from this district, and the whole number from the United States was probably seven hundred, giving employment to nearly ten thousand men.

“Large shipments of the products of this business were made to the West Indies, principally to the French ports ; eighteen sail of vessels were at one time lying in Point Petre from Newburyport, a large proportion of the eastern cargoes of which were fish, the returns of which, being transshipped to Europe, afforded them profitable results, which were the foundation of the great estates of the merchants of that time, some of whom were then, and had been previously, engaged in this business themselves.

“The shipments to the Mediterranean and other ports in Europe were still more extensive. These, with those to the West Indies and South America, for the five years from 1803 to 1807 inclusive, were but little short of \$2,500,000 annually, and in 1804 they exceeded \$3,000,00, owing to the products of the Labrador fishery, both in fish and oil, being peculiarly adapted to the markets. Such were the advantages attending the operations of the American fishermen, in consequence of the European war, which in its effects operated to make them fishermen for the world, that an investment in this fishery, with the shipment of its proceeds to these markets, generally gave returns of from fifty to one hundred per cent profit. Aside from accident or mismanagement of the voyage, the annual supply from 1803 to 1808 was probably 700,000 to 800,000 quintals.

“The long embargo, as it has been termed, took place at an inauspicious season of the year for the interests of those engaged in this business. It found them with a year's stock on hand, and, by stopping all exports, the article was reduced to fifty per cent of its former value. But no extensive sale could be made ; the holders were compelled to keep them during its continuance, and at its repeal the damage by depreciation in quality, and the glut of all foreign markets in consequence of large shipments at the same time, resulted in great loss, and the ruin of many of those engaged in the business.

“At the commencement of the war with Great Britain, in 1812, nearly all the larger and more valuable class of vessels, as they returned from their voyages, were laid up and dismantled. Some few of the others pursued the business during the first season, with but little interruption ; but during the succeeding years, the policy of capturing and destroying all such as were found ‘on his Majesty's waters’ prevailed ; which resulted in the entire abandonment of the business, except by market-boats in the vicinity of ports, which afforded them opportunity to escape on the appearance of British cruisers. The whole amount of bounties paid to fishing-vessels, in 1814, was but \$1,312, including the export bounty on pickled fish.

“ Since the peace, which was concluded by the negotiations at Ghent, difficulties have attended the pursuit of this business on some parts of the coasts of the British Provinces, in consequence of an abandonment of some of the previous privileges on the western coasts of those Provinces, or an ambiguity in the provisions of the treaty, which has produced feelings of acrimony between the fishermen of the two nations.

“ It has been pursued with various degrees of success at different periods. For a few years succeeding the peace, the stock of fish on the Grand Bank, Labrador Coast, and other fishing-grounds, appeared to have been greatly replenished; operations in the business were successful, and its pursuit became generally extended. The tonnage employed in 1815 was about 8,000 tons, and in 1816 about 18,000 tons.

“ A laudable spirit of enterprise, and a conviction of the advantages resulting to the laboring classes from its prosecution, determined the citizens of Newburyport and other towns to attempt its further extension. Companies were formed in several of our seaports, with extensive capitals, and managed by agents selected for their experience in the business; but owing to ill-success in some of their voyages, the depressed prices of its products, and their shipment to European and other foreign markets, which derived sufficient supplies from their own fisheries and those of other nations (which, owing to the general peace in Europe, were enabled to resume the business), they all proved unsuccessful, and the results were generally disastrous to the stockholders; — furnishing good evidence that, in a country like our own, individual enterprise offers the surest prospect of success in all branches of business, where the amount of capital or the particular location requisite for its prosecution does not prevent the attainment of its means, and thereby render a resort to combined effort necessary for its accomplishment.

“ Of late years, an entire change of markets for the products of this fishery, so far as it respects the large-sized fish, has taken place. Since the opening of the Erie Canal, and the increase of population and means of conveyance consequent thereto, an increasing demand for this article has taken place in that quarter; so that New York and Albany markets, which previously required a few thousand quintals for their annual supply, now afford a demand, for their own markets and those above, for nearly 150,000 quintals; as their annual supplies, and the increasing facilities for transportation by canals and railroads from other Southern and Western cities, create an increasing demand for the supply of those markets.

“ The foreign export has diminished in a ratio proportionate to the increase in demand for domestic markets; — from upwards of \$ 2,500,000 from 1803 to 1806, it has been less than \$ 1,000,000 for the last ten years. The products of this fishery, in Essex County, exceed \$ 600,000 annually.

“The quantity of codfish taken for the last five years is probably as great as that of any preceding five, with the exception of those from 1803 to 1807 inclusive, when the Labrador fishery was carried to its greatest extent. The quantity taken in this State, with those in New Hampshire, Maine, and some in other States, will give an annual amount exceeding 700,000 quintals, and, with its oil and other products, exceeding \$ 2,000,000 in value.”

The above has evidently been prepared with care, and is unquestionably accurate. In some portions of the State, this fishery is entirely superseded by the taking of *whales*. Thus, while every town in the county of Barnstable is more or less engaged in this business, and collectively they exhibit an aggregate of two hundred and twelve vessels, but *a single fishing-smack* was licensed in Dukes County in 1836, and *not one* in the county of Nantucket, — the attention of the inhabitants of the last two counties being entirely engaged in whaling. I have ascertained that, in 1836, there were engaged in the cod-fishery, from Gloucester, Marblehead, Provincetown, Wellfleet, Cohasset, Duxbury, Plymouth, Manchester, Salem, and Beverly, being *ten* towns, 561 vessels, having crews of 3,816 men, and that by these vessels there were taken 263,454 quintals of fish. To these may be added the ports of Newburyport, Lynn, Falmouth, Holmes’s Hole, and Sandwich (in which I have not been able to learn the number of vessels *exclusively* employed in this fishery), which furnished, in 1836, 16,265 quintals; thus exhibiting 279,718 quintals of codfish taken by the enterprise of the citizens of fifteen towns. When it is mentioned that about 3,500 of the codfish from the Grand Bank (which are generally much larger than those from the Straits of Belleisle) constitute *one hundred quintals*, some conception may be formed of the immense numbers taken. At the usual price of these prepared fish, the above-mentioned number of quintals would sell for \$ 839,154.

According to the returns of the assessors of the several towns, it appears that there were taken, in 1836, 510,554 quintals of codfish, which were valued at \$ 1,569,517. These fish were from the following counties: — Essex, 159,424 quintals, valued at \$ 501,363; Barnstable, 134,758 quintals, valued at \$ 392,930; Suffolk, 127,250 quintals, valued at \$ 408,510; Plymouth, 64,172 quintals, valued at \$ 193,664; Norfolk, 15,950 quintals, valued at \$ 46,050; Middlesex, 9,000 quintals, valued at \$ 27,000.

The statistics, derived from the same sources, for the year ending April 1st, 1845, prepared by the Secretary of State, present us with the following facts. Whole number of quintals taken, 334,901, valued at \$ 746,263. From Essex County, 175,273 quintals, valued at \$ 374,815; Barnstable, 84,503 quintals, valued at \$ 190,267; Plymouth, 61,007 quintals, valued at \$ 146,665; Suffolk, 6,600 quintals, valued at

\$ 15,840; Norfolk, 3,771 quintals, valued at \$ 9,485; Middlesex, 2,100 quintals, valued at \$ 5,040; Bristol, 1,400 quintals, valued at \$ 3,500; Dukes, 247 quintals, valued at \$ 651.

The minutiae of a fishing-voyage to the Grank Bank are described in an interesting manner, in the following communication, by an anonymous writer, in a number of the "Boston Centinel and Gazette," for September 4, 1839.

"There are about eighty vessels, all schooner-rigged, employed in the Bank fishery, which are built principally of oak, in Massachusetts. They are strong, stanch, and comfortable sea-boats, averaging in burden from sixty to one hundred and ten tons; but the principal part of them are from seventy-five to eighty tons' burden, and cost from \$ 3,500 to \$ 4,000 each. They make two fares in a year; the first fare commencing early in April, at which time they sail for the Bank of Newfoundland, commonly called the 'Grand Bank.' The second fare commences early in September. The duration of each fare depends, of course, on the degree of success attending it; but four months must be passed each season in fishing, in order to secure the bounty offered by the general government for the encouragement of the fisheries, amounting to four dollars per ton on all vessels of ninety tons and under; no allowance being made for any excess of burden. Each vessel takes from one hundred and twenty to one hundred and thirty hogsheads of salt for a fare, at from \$ 3 to \$ 3.25 per hogshead. Cadiz salt is preferred, but occasionally other kinds are used. More salt is now expended in curing the fish than formerly; and one hundred quintals of fish require about thirteen hogsheads of salt. Occasionally, though but seldom, a 'spring fare' is made; when the vessel is expected to return by old 'Election-day.' This fare is called 'Spring-fish,' and usually consumed in the neighborhood, being of superior quality. The word '*fare*' applies as well to the cargo or lading of the fish, as to the voyage.

"The 'shoresman,' as the title implies, and who is generally sole or part owner of the vessel, superintends all operations on shore relative to the fare. In addition to the vessel, he furnishes the salt and bait; the latter article being either salted clams or mackerel, in barrels. He also supplies the knives for splitting the fish, mittens for the crew while splitting and salting, and trousers of oil-cloth or canvas for the 'salter.' This part of the outfit is called the 'great general,' three eighths of which is paid for by the shoresman, and five eighths by the crew (consisting generally of a skipper and five men), at the final settlement of the fare. In contradistinction to the 'great general,' the 'small general' is furnished by the crew, consisting of their sea-stores, the expense of which is entirely defrayed by themselves; and each man provides his own fishing-apparatus.

Barrels are provided by the shoresman to contain their store of fresh water, but all subsequent cooperage is paid for by the crew.

“A fair passage to the Bank is made in a week ; and on their arrival there, they generally ‘lie-to, and try for fish’ ; and when they ‘strike a school,’ as the phrase is, they anchor. The depths at which they fish are various, from thirty to sixty fathoms ; but generally from thirty-five to fifty fathoms. When fish are plenty, a fare is made up in about six weeks ; that is, when they have *wet*, or expended, all their salt. Fish caught with mackerel-bait are larger than those caught with clams, for the supposed reason that a larger bait of mackerel can be put upon the hook than of clams ; and the largest fish take the largest bait. Whatever may be the reason, however, the fact is incontrovertible ; and the proportional difference is about thus : fish caught with clam-bait will average about twenty-five quintals to the thousand fish, and those caught with mackerel-bait about forty quintals to the thousand.

“This is a general result ; but there are occasional variations from various causes, the principal of which is in the different depths at which the fish are taken, — the largest fish being taken in the deepest water. The flesh of a sea-bird called a ‘hag-don’ is a fine bait for codfish, and is frequently used.

“The equipment of the fishermen is singular and grotesque. Over their common dress they wear a pair of ‘petticoat-trousers,’ made very wide, and descending to the calf of the leg ; generally they are made with an insertion for each leg, but sometimes like a woman’s petticoat, with no intersecting seam, and are of course canvas or oil-cloth. A pair of thick cowhide boots, of a russet color, and with soles an inch or more thick, reach quite to the knees, with tops to turn up and cover the thighs. The barvel, or leather apron, extending from the breast to the knees, and the tarpauling hat, complete the costume, which secures to the occupant perfect immunity from the assaults of the element in which he procures his subsistence. The hands are preserved from the cutting of the fishing-lines by a sort of digitless woollen mittens, called ‘nippers.’ Each man tends two lines, and they generally fish near the bottom of the sea ; but sometimes the codfish will ascend to mid-water, or even much higher, in pursuit of herrings, capelins, and other fishes of that class, which swim in immense shoals near the surface ; and in such cases the labors of the fishermen are much lightened, and the fish taken with much greater celerity.

“In the day-time, during the first fare, all hands generally fish ; and at night, the crew is divided into watches that fish alternately ; but circumstances create variations in this mode ; such as the scarcity or abundance of fish, the inclinations of the skipper and crew, &c. During the season of the second fare, the fish feed principally in the

.

night, at which time most of them are taken ; and on the succeeding day they are prepared and secured below. At any time, however, when the decks are full of fish, they proceed to cure them ; and this is the process. The operators being placed in juxtaposition before a bench or platform, about mid-height, the 'cut-throat,' wielding a sharp two-edged knife, which bears the same sanguinary and ominous name, seizes the fish, and, separating the connecting integuments between the head and the body, he then passes his knife through from the nape to the vent, and abstracts the viscera. He then passes it to the 'header,' who, by an adroit process, separates the articulation of the spine at the shoulder, and detaches the head from the trunk, which he passes to the 'splitter' ; who, commencing at the shoulders, proceeds to lay the fish open to the tail, and detach the sound-bone. The fish, being thus prepared, is thrown into the hold, to the 'salter,' who strews on the salt and stows it neatly away, in compact layers, with the skin down. And in this manner they proceed daily till all the salt is wet, if they are so fortunate as to get a full fare. They are sometimes obliged, however, by the scarcity of fish, by losing their anchors, by sickness or casualty on board, or other causes, to return without wetting all their salt.

" Besides the bodies of the codfish, and the bounty, there are other emoluments accruing to the adventurers ; such as the oil extracted from the livers of the cod, of which about fifteen barrels to eight hundred quintals of fish is produced, and is sold at about fifty cents per gallon ; and halibut, which was mostly thrown away formerly, but now constitutes a considerable proportion of the profits. It is salted like the codfish, and sold *green* from the vessel, on arrival, at about two dollars per quintal ; the subsequent processes of drying and smoking for the market being performed by the purchasers. This article is mostly derived from the second fare ; and about fifteen thousand quintals are annually brought into Marblehead, and, with the oil, are divided in the same proportions as are the codfish and the bounty. As regards the proportional proceeds of the fare, on return of the vessel to port, one quarter part is considered to be the property of the shoresman, and the other three quarters of the crew ; but the shoresman is allowed one eighth part more on articles that it is his province to prepare for the market, such as drying the codfish, &c. The sounds, or air-bladders, and the tongues of the codfish, with the fins of the halibut, collectively called 'garney,' are the perquisites of the crew, but of which the shoresman is allowed some proportion, according to mutual convention. From twenty to thirty barrels to a fare are saved ; the fins selling for about eight dollars per barrel, and the sounds and tongues for from six to seven dollars. When the vessel returns, she is moored, head and stern, at about a cable's length from the shore, and the crew proceeds to 'wash out' the fare ; which is done by unlading it into boats,

taking it into about eighteen inches' depth of water, and throwing it out, when it is washed clean, and then transported to 'the fence,' as the enclosure is called where the fish are dried. It is then placed in 'water-horse'; that is, it is staked up in a pile, with the skin up, to drain; thence it is taken to 'the flakes,' to be dried. The flakes are a series of horizontal hurdles, at a convenient height from the earth for the shoresman and his hired men to spread, turn, and take off the fish, — the labors of the vessel's crew ceasing with the 'washing-out.'

"Two good 'fish-days,' with a subsequent airing of a few hours, — when the fish are sold, they being now more heavily salted than formerly, — are sufficient to preserve them, and this process is called 'Albany drying'; it is, however, by this mode now considered sufficiently cured for any market. Last year, the fish thus prepared was sold at from 19 shillings, or \$3.16 $\frac{2}{3}$, to \$3.50 per quintal; this year it commands about \$3 $\frac{3}{8}$ per net hundred-weight, and is always sold for cash."

Besides these immense quantities of codfish which are taken at the Grand Bank and salted and dried, large numbers are brought fresh into all the markets along the seaboard, and thence are distributed throughout the interior of the State. At Duxbury, in 1836, there were *ten* market-boats, having forty men on board, which took from 48,000 to 50,000 fish. At Provincetown there were also *ten boats* thus engaged. Boston market is supplied with codfish by about fifteen or twenty small schooners and a large number of boats.

By the kindness of Captain Nathaniel Blanchard, of Lynn, master of one of these smacks, I am enabled to furnish the following facts, by which some idea may be formed of the amount of *fresh codfish* brought to our market. He has presented me the result of his labors with a vessel of twenty-five tons, and a crew of six men, for nearly five months, commencing October 24, 1836, and terminating March 20, 1837. His account exhibits the number of fish taken, and the price obtained for the same, for each day during that period. From this minute statement, I am able to ascertain that the *largest quantity* taken any one day was 7,124 pounds, on the 13th of December, which sold for five shillings per hundred = \$59.39. The *smallest quantity* taken any one day was 337 pounds, on January 16th, which sold for twelve shillings = \$6.67. The smallest receipts were on March 20th, when 359 pounds were taken, which sold for ten shillings six pence = \$5.92. The whole number of pounds taken during the period mentioned was 194,125. The entire receipts for the same were \$3,026.14.

My old friend, Captain Nathaniel E. Atwood, has also furnished me with an account of his cod-fishing, with a crew of five men, from December 26, 1846, to May 8, 1847.

Arrival in Boston.	No. of Cod.	Whole Weight.	Price at Wholesale.	Whole Stock.
January 4,	326	3,931	8s. 6d.	\$ 55.20
“ 16,	315	3,637	6 9	40.55
February 11,	840	10,823	9 0	162.34*
“ 19,	824	10,933	8 0	144.36
March 1,	293	5,395	10 6	94.39
“ 8,	591	8,093	8 0	108.12
“ 20,	260	2,862	8 3	40.77
April 2,	420	4,651	10 0	75.48
“ 12,	130	938	8 0	12.97*
	<hr/> 3,999	<hr/> 51,263		<hr/> \$ 734.18

The above were taken north of Cape Cod.

	No. of Cod.	Weight.	Split Cod.†	Stock.
April 20,	902	620	5,055	\$ 81.76
“ 27,	299	1,061	1,418	42.06
May 3,	530	1,953	2,038	62.79
“ 8,	474	373	3,568	53.82
	<hr/> 2,205	<hr/> 4,007	<hr/> 12,079	<hr/> \$ 240.43

The above were taken south of Cape Cod. On the 18th of April, Captain Atwood himself caught one hundred and seventy-three codfish and two halibut in twenty-nine fathoms of water.

The following extract from a letter of Captain Blanchard will show the success of a single half-day. “This day,” November 25, 1846, “eleven fishing-smacks have been out fishing, manned by seventy-five men; they have taken 75,000 or 76,000 pounds of fish, making an average of a little more than a thousand weight to each man. We fished but half of the day, on account of the snow-storm.” •

Generally speaking, this species “schools” but little, and is met with straggling all along the coast. It is a very voracious fish, eating almost every kind of food it can obtain. The fishermen consider the *herring* the best bait they can use in fishing for it, although they frequently catch them with *young flounders*, *cuttle-fish*, &c. When fishing on a *muddy bottom*, it is some time before the cod begins to take the hook; when, however, they are fished for upon a rocky bottom, they seize the bait at once. The hook should be suspended from three to five feet above the bottom of the sea, else the bait is taken off by skates.

* Two days' fishing.

† The split fish were sold by contract for eight shillings per hundred; none being split which could be sold entire.

As well as the Bank fishers, our shore fishers preserve the livers of this species for their oil. A good-sized cod liver yields half its weight of oil. Three barrels of livers yield one barrel of oil; almost all the remainder of the liver is water. A barrel of *cod oil* is worth from eleven to fourteen dollars. The oil furnished by the *cod upon our coast* is called shore oil, which is inferior to the Labrador or Bank oil. It is the habit of our fishermen to mix the livers of all the fishes which furnish oil together, and sell them for shore oil, — such as those of the pollock and hake, both of which furnish more oil than the liver of the cod, and that of the haddock, which yields but little oil.

Specimens of the cod are occasionally taken which are more or less mutilated; and sometimes, also, suffering from disease. The ventral or pectoral fins are lost. Captain Atwood has seen a cod with an injured spine, causing a distortion of the head to one side. Frequently specimens are caught much scarred, and with large sores upon their surface. Sometimes the sore becomes very hard, the surrounding parts inflame, and the fish emaciates; or the gall-bladder becomes enlarged, and the bile hardened, so that it can scarcely be cut with a knife.

In the month of February, the cod leaves the vicinity of the land, and goes off into deeper water. There are several varieties, differing in their color and markings, probably produced by difference of locality or food, which are known by the names of "Rock-Cod," "Shoal-Cod," &c.

The American cod grows to a very great size. Yarrell states that the largest cod of which he has any record weighed *sixty pounds*. Pennant refers to one weighing *seventy-eight pounds*. Captain Nathaniel Blanchard, of Lynn, has seen a cod weighing *eighty-six pounds*. Mr. Jonathan Johnson, Jr., of Nahant, has seen one taken weighing *eighty-eight pounds*. A cod weighing *one hundred pounds and a half* was taken at Provincetown in the winter of 1846–47, by one of the crew of Captain Emery's fishing-smack. The largest specimen of which I have any certain information, Mr. Anthony Holbrook, fishmonger in Boston Market, assures me he saw caught, in the spring of the year 1807, at New Ledge, sixty miles southeast of Portland, Maine; it weighed *one hundred and seven pounds*. Captain Atwood has *heard* of one said to weigh *one hundred and twelve pounds*.

In a Portland paper of September 13th, 1840, is an account, copied from the "Halifax Recorder," of a codfish exhibited in the fish-market at that place, measuring eight feet three inches in length, and forty inches in circumference.

MORRHUA ÆGLEFINUS, *Lin.**The Haddock, Cuv.*

(PLATE XXVIII. FIG. 1.)

- Gadus æglefinus*, LIN., Syst. Nat. (12th edit.), p. 435.
 " " *Haddock*, BLOCH, II. p. 125, pl. 62.
 " " " SHAW, Gen. Zoöl., IV. p. 136.
 " " " PENNANT, Brit. Zoöl., III. p. 241.
 " " " JENYNS, Brit. Vert., p. 441.
 " " " MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 570.
Morrhua æglefinus, *Haddock*, GRIFFITH'S CUV., X. p. 484.
 " " " YARRELL, Brit. Fish., 1st edit., II. p. 153, fig.; 2d edit., II. p. 233, fig.
 " " " STORER, Report, p. 124.
 " " " DEKAY, Report, p. 279, pl. 43, fig. 138.
 " " " STORER, Mem. Amer. Acad., New Series, II. p. 467.
 " " " " Synopsis, p. 215.

Color. This species is of a dark-gray color above the lateral line, and of a beautiful silvery-gray beneath it, with a large circular or oblong blotch on each side, on a line with the middle of the pectorals, and just above them, which at its upper portion generally extends above the lateral line, its larger part being beneath that line. The gill-covers are much lighter-colored than the top of the head and snout, with a purplish tinge after death. The dorsal, pectoral, and caudal fins are bluish; the anal fins are of the color of the abdomen; the ventrals are rather lighter than the anal. The lateral line of a jet-black color. Pupils black, irides bluish.

Description. Stout in front of the first anal fin, gradually diminishing in size posterior to this. Length of the head less than one fourth the length of the body; depth of the body across from the anus less than the length of the head. Neck convex; top of the head between the eyes flattened; snout prominent. The upper jaw projects beyond the lower, and has several rows of sharp, pointed teeth; a single row of teeth are observed in the lower. A very minute barbule is suspended from the chin. The posterior nostril is much larger than the anterior. The eyes are circular; the diameter of the eye is rather more than one sixth the length of the head; the distance between the eyes is equal to about one fourth the length of the head.

The lateral line commences just above the posterior angle of the operculum, and assumes the curve of the body until on a line with about the middle of the second dorsal fin, when it takes a straight course, and terminates at the base of the caudal rays.

All the fin rays are enveloped by a thick fleshy membrane.

The first dorsal fin is high and triangular, and three fifths the length of the second dorsal ; it commences on a line above the base of the pectorals.

The second dorsal arises just back of the first, on a line above the posterior extremity of the pectoral fin, and is equal in length to the head ; its first rays are equal in height to nearly the length of the fin ; its last ray is very minute ; this fin terminates just anterior to the third dorsal.

The third dorsal is of the same form as the second, and a little longer than the first.

The pectorals are triangular ; in height they are equal to the length of the third dorsal ; their rays are multifid.

The ventrals are situated in front of the pectorals ; the extremities of their first two rays are free ; the second ray is the longest.

The first anal fin commences on a line back of the second dorsal, and is formed like that fin.

The second anal arises just back of the third dorsal, and terminates nearly on a line with it.

The caudal fin is emarginated.

The fin rays are as follows : — D. 16, 24, 20. P. 21. V. 6. A. 26, 21. C. 35.

Length, one to two feet.

Remarks. Immense numbers of this species are found on our coast in the spring, and continue through the season until autumn. The best haddock are caught on rocky bottoms, where in summer they are most plenty ; but in the colder portions of the year they are most abundant on clayey bottoms. It is not an uncommon circumstance for haddock to remain on the fishing-ground with a large school of cod. About thirty years since, this species was comparatively rare at Cape Cod ; in 1839, when my "Report on the Fishes of Massachusetts" was published, it was almost as common there as in any part of the bay. It is estimated that in the warm season about twelve hundred-weight of haddock are taken to one hundred-weight of codfish in Massachusetts Bay, and in the winter about twelve hundred-weight of cod to one hundred-weight of haddock ; but as the haddock-fishery is of longer duration, the quantities through the year will average about the proportion of three haddock to one cod. Large numbers are sold in the market ; during the entire summer it is eaten by the poorer classes, who are often able to obtain from the fishing-smacks a fine fish weighing several pounds for one or two cents. When boiled or made into a chowder, it is an excellent table-fish.

In the winter, this fish is worth about a dollar and a quarter a hundred-weight, while the cod is worth a dollar and three quarters a hundred-weight. This species is sometimes taken weighing seventeen pounds, although the average weight is between two and six pounds.

Maine, Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

MORRHUA PRUINOSA, *Dekay*.

The Tom-Cod.

(PLATE XXVII. FIG. 5.)

- Frost-Cod*, and *Frost-fish*, PENNANT, Arctic Zoöl., Supplement, p. 114.
Gadus pruinus, *Tom-Cod*, or *Frost-fish*, MITCH., Report in part, p. 4.
Gadus tomcodus, *Tom-Cod*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 368.
Morrhua tomcodus, *Tom-Cod*, STORER, Report, p. 126.
Morrhua pruinosa, *Tom-Cod*, DEKAY, Report, p. 278, pl. 44, fig. 142.
 " " " AYRES, Bost. Journ. Nat. Hist., IV. p. 276.
 " " " STORER, Mem. Amer. Acad., New Series, II. p. 468.
 " " " " Synopsis, p. 216.

Color. This species varies exceedingly in its color. Generally it is brown, greenish, or yellowish-brown, with deeper patches, spots, and blotches; beneath lighter. The whole upper portion of the sides is sprinkled with irregular black points or dots, which are continued upon the ventral, pectoral, and anal fins. The abdomen in front of the vent is almost free from dots in some specimens. Pupils black, irides golden.

Description. Body oblong, abdomen somewhat prominent. The length of the head is rather less than one fifth the length of the body. The depth of the fish over the anus, exclusive of the dorsal fin, is about one sixth the length of the body. The upper jaw projects beyond the lower; the snout is blunt; beneath the chin is situated a small barbel. Compact, small, and sharp teeth in the intermaxillary bone, lower jaw, and upper palatine bones. The eyes are circular; their diameter is equal to less than one half the distance between them. The nostrils are double, situated just anterior to the eyes; the posterior and inferior is much the larger.

The lateral line, arising above the operculum, curves upward to a line opposite the termination of the pectorals, and just beyond these fins commences a straight course, which is continued to the base of the caudal rays.

The first dorsal fin, which is of a triangular form, commences opposite the middle of the pectorals.

The second dorsal is subquadrangular.

The third dorsal is one fourth shorter than the second, and longer than the first.

The pectorals are one fourth shorter than high.

The ventrals are situated in front of the pectorals ; the first two rays are free at their extremities ; the second ray is considerably the longer.

The first anal fin is more than as long again as high.

The second anal is shorter than the first anal, and is of the same form as the third dorsal. The anals are separated from each other by a space equal to one fourth the length of the second anal.

The caudal fin is rounded at its posterior extremity.

The fin rays are as follows : — D. 13, 18, 19. P. 17. V. 6. A. 22, 18. C. 39.

Length, twelve to fourteen inches.

Remarks. This common species is taken by the hook from our wharves and bridges in the summer ; and through the winter, Boston market is supplied with this fish from the mouths of the rivers in the vicinity, where it is taken in dip-nets. The amount of tom-cod taken at Watertown alone is estimated at two thousand bushels annually ; about half of these are sent to Boston market, and the remainder to the neighboring towns.

Maine, Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, MITCHELL, DEKAY.

GENUS II. MERLANGUS, Cuv.

Three dorsal and two anal fins. No barbels to the chin.

MERLANGUS PURPUREUS, Storer.

The Pollack.

(PLATE XXVIII. FIG. 3.)

Gadus purpureus, *New York Pollack*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 370.

Merlangus Purpureus, *Pollack*, STORER, Report, p. 130.

“ “ *New York Pollack*, DEKAY, Report, p. 286, pl. 45, fig. 147.

“ “ STORER, Mem. Amer. Acad., New Series, II. p. 472.

“ “ “ Synopsis, p. 220.

Color. The upper part of the head and body is of a greenish-brown color ; the sides are lighter ; the abdomen is white. In very small specimens, the color above is deeper, and the abdomen is reddish. The pupils are black ; the irides silvery, with greenish reflections. The dorsal, pectoral, and caudal fins are of the color of the back. The ventrals are white. The first anal fin is white at its base, and bluish above ; the second

anal has a longitudinal white line at its base, and, as well as the first dorsal, is whitish at its top. The lateral line is grayish.

Description. Body oblong, subcompressed. Slightly arched above to the origin of the first dorsal fin. Its greatest depth about equal to the length of the head. The head is more than one fourth as long as the body, flattened above, somewhat pointed at the snout when the jaws are closed. The eyes are large; their diameter is less than half the distance between them. The gape of the mouth is quite large; the tongue is large, fleshy, fuliginous. The lower jaw is longer than the upper; minute teeth in both jaws; a single row only in the lower. The posterior nostril the larger. A line of mucous pores is situated on both maxillary bones, and upon the lower portion of the opercula. The division between the gill-covers is scarcely distinguishable when first examined; the posterior angle of the operculum is obtuse.

The lateral line, commencing above the posterior angle of the operculum and slightly curving over the pectorals to their extremity, pursues a straight course to the middle of the caudal rays.

The first dorsal fin is triangular, and arises opposite the middle of the pectorals.

The second dorsal is more than as long again as the first; the rays gradually diminish in height to the last, which is very short.

The third dorsal is three times as long as high, and terminates opposite the second anal.

The pectorals arise just beneath the posterior angle of the operculum; their depth at their base is equal to one third their height.

The ventrals are just in front of the origin of the pectorals; their second and third rays are longest.

The first anal fin arises opposite the commencement of the second dorsal, and terminates on a line opposite the termination of that fin.

The second anal is about half the height of the first; the first two rays are short and simple.

The caudal fin is large, strong, forked; the length of the outer rays is equal to the distance between the extremities of the fin when expanded.

The fin rays are as follows: — D. 14, 22, 21. P. 20. V. 6. A. 22, 21. C. 24 $\frac{8}{9}$.

Length, one to three feet.

Remarks. Immense numbers of this species are found in our waters in spring and autumn. A fleet of twenty or thirty boats frequently go off to Jeffries' Ledge, east of Cape Ann, in the fall of the year, and, having fastened their craft together, and thrown overboard a quantity of bait to entice the fish, capture in a single night from thirty to

forty quintals of pollack to a boat. When prepared in the same manner as the cod when intended for dun-fish, with proper care and good salt, this is really an excellent fish, and its value is increased from nine shillings to three or four dollars per quintal.

Maine, Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

GENUS III. LOTA, CUV.

Body elongated. Two dorsal fins. A single anal fin. One or more barbels on the chin.

LOTA COMPRESSA, *Lesueur*.

The Eel-pout.

(PLATE XXVIII. FIG. 4.)

Gadus compressus, LESUEUR, Journ. Acad. Nat. Sciences, I. p. 84.

Le Molve Hunt (Molva Huntia), LESUEUR, Mémoires du Muséum, v. p. 161.

Lota compressa, *Eel-pout*, STORER, Report, p. 134.

" " " THOMPSON, Hist. of Vermont, p. 147.

" " *Compressed Burbot*, DEKAY, Report, p. 285, pl. 78, figs. 244, 245.

" " STORER, Mem. Amer. Acad., New Series, II. p. 471.

" " " Synopsis, p. 219.

Color. The back and sides of this species are of a yellowish-brown, variegated with darker spots, which are more distinct anterior to the dorsal fin; abdomen yellowish. The first dorsal fin is lighter than the body, and variegated with black. Upon the lower portion of the second dorsal is a row of dark-colored spots, and its edge is margined with black.

Description. The body in front of the first dorsal is cylindrical, beginning to be compressed at the sides at the extremity of the pectorals, gradually becoming more so towards the tail, so that the caudal rays appear as a membranous prolongation of the body. The entire surface is covered with minute scales, appearing like cup-shaped depressions. The head is very much compressed above; its length is equal to one sixth the length of the body. The eyes are circular; the distance between them equal to one fourth the length of the head. The nostrils are double; from the back of the anterior nostril a very minute cirrhous is suspended. The upper jaw is the longer; to the chin is attached a cirrhous of a length nearly equal to the distance between the eyes. The jaws and palatines are armed with numerous minute, sharp teeth.

The lateral line arises above the operculum, and extends in a straight course to the middle of the fleshy portion of the tail.

The first dorsal fin is small, subquadrangular when expanded ; it is situated one sixth the length of the fish back of the head.

The second dorsal, arising just back of the first, is continued to the tail ; it is rounded at its posterior extremity.

The fan-shaped pectorals are three quarters the length of the head.

The ventrals are small, and terminate in a point.

The anal fin arises on a line just back of the origin of the second dorsal ; it is of the same length as that fin, and, like it, is joined to the caudal fin.

The caudal is rounded at its extremity.

The fin rays cannot be accurately made out, owing to the fleshy membrane of which they are formed.

Length, six inches.

Remarks. This species was first described by Lesueur from a specimen taken at Northampton. The individual which has enabled me to furnish the above description was also brought from the Connecticut River, by Thomas M. Brewer, M. D., of this city.

GENUS IV. MOTELLA, Cuv.

Body elongated, cylindrical, compressed posteriorly ; the first dorsal fin very slightly elevated, delicate in structure, scarcely perceptible ; second dorsal and anal fins long, continued nearly to the base of the tail.

• MOTELLA CAUDACUTA, *Storer*.

(PLATE XXIX. FIG. 1.)

Motella caudacuta, STORER, Proc. Bost. Soc. Nat. Hist., III. p. 5.

Color. The general color of the body is a yellowish-brown ; the posterior margin of the second dorsal and anal fins, as well as the edges of the caudal fin, of a dark-slate color ; the whole of the pectorals also of this color ; the ventrals are lighter. The body beneath is lighter ; the throat and lower jaw are externally much lighter than the rest of the body ; the inside of the mouth and tongue are purple. The barbels on the snout of the color of the head ; that on the chin colorless.

Description. The body of this species is elongated ; cylindrical anteriorly, much compressed posteriorly. The head above is flattened posteriorly, and rounded anterior to the eyes. The snout is blunted. The length of the head is equal to one sixth the length of the entire fish ; the depth of the body is equal to about three fourths the

length of the head. The gape of the mouth is large. The upper jaw is the longer ; a single row of sharp teeth in each jaw. The nostrils, situated just anterior to the eye, are large. The eyes are horizontally oblong ; their longest diameter is equal to one fourth the length of the head. On each side of the snout, just anterior to the nostril, is a barbule half the length of the head ; between these two, at the anterior inferior angle of the snout, is a third, much smaller ; from the chin hangs another barbule, of about the same length as the third.

The uninterrupted lateral line arises at the posterior superior angle of the operculum, and passes obliquely downwards to near the centre of the fish, when it pursues a straight course to the tail.

The first dorsal fin has one free ray, which is three fourths the length of the head ; the remainder of the fin consists of minute hair-like rays situated in a groove of the length of the first ray, in which, when unexpanded, they are all concealed. Directly back of this groove the second dorsal commences, which is continued to the fleshy portion of the tail, terminating just anterior to the caudal rays ; it is of about the same height throughout.

The vent is upon the anterior half of the body.

The anal fin commences directly back of this, and terminates on a line opposite the second dorsal ; this fin is not as high as the dorsal.

The ventral fin has the first two rays free ; the second ray is the longest.

The pectoral fins are three fourths as high as the length of the head, and are rounded posteriorly.

The caudal fin is about as long as the height of the pectorals, and tapers to a point.

The fin rays are as follows : — D. 53. P. 16. A. 48. C. 24.

Length, six inches.

Remarks. The specimen here described was one of two taken at Long Point, Provincetown, by Mr. Heman M. Smith, of that place. They had apparently been thrown ashore but a short time previously, being perfectly fresh. Since these were found, Captain Atwood has noticed several specimens in the stomachs and mouths of codfish caught in Massachusetts Bay during the winter.

GENUS V. MERLUCIUS, Cuv.

The head flattened; the body elongated; the back furnished with two dorsal fins, the first short, the second long; but one anal fin, also very long; no barbels at the chin.

MERLUCIUS ALBIDUS, *Dekay*.*The Whiting.*

(PLATE XXVIII. FIG. 2.)

Gadus albidus, *New York Whiting*, MITCH., Journ. Acad. Nat. Sciences, I. p. 409.*Gadus merlucius*, *The Hake*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 371.*Merlucius vulgaris*, *Hake*, STORER, Report, p. 132.

" " " AYRES, Bost. Journ. Nat. Hist., IV. p. 276.

Merlucius albidus, *American Hake*, DEKAY, Report, p. 280, pl. 46, fig. 148.

" " STORER, Mem. Amer. Acad., New Series, II. p. 470.

" " " Synopsis, p. 218.

Color. When alive, this species is of a rusty-brown color upon the upper portion of the sides, golden in the sun; silvery beneath. Pupils black, irides with golden reflections. Dorsal and caudal fins rusty; pectorals and ventrals fuliginous; anal colorless. The whole interior of the mouth, jaws, throat, and tongue of a beautiful purple. Pupils black, irides silvery. The lateral line is lighter-colored than the upper part of the body.

Description. Body elongated, somewhat compressed in front of the anus, rounded posteriorly. The length of the head is equal to one fourth the length of the body. The top of the head is flattened, exhibiting depressions. The lower jaw is slightly the longer. The jaws as well as the palatine bones are armed with a row of prominent, sharp, incurved teeth, exterior to which is a row much smaller. Numerous teeth in the pharynx. The tip or middle of the upper jaw is edentate. A deep furrow exists in the suborbital bones, extending from the side of the snout in the upper jaw to the posterior portion of the preoperculum; and beneath the lower, from the chin to the outer angle of the jaw. The eyes are large and circular; their diameter is equal to more than half the distance between them. The inferior portion of the gill-covers is naked, the upper portion is scaly. The scales upon the top of the head are smaller than those on any other part of the body. Those on the opercles are smaller than those of the body. At the anterior angle of the eye, a bony process is observed; just in front of this process are situated the nostrils; the anterior is circular, the posterior, which is much the larger, is vertical.

The lateral line, appearing like a smooth raised ridge, arises at the superior posterior angle of the operculum, and pursues a slightly oblique course to the anterior half of the second dorsal, and thence passes in a straight line to the tail.

The first dorsal fin, which is short and triangular, arises on a line a short distance behind the origin of the pectorals. The second, third, and fourth rays of this fin are the highest, and equal in their height to the length of the fin. The last rays are very short. The distance between this fin and the second dorsal is equal to about one third the length of the first dorsal.

The second dorsal is more than three times as long as the first. A deep emargination is observed between the nineteenth and twentieth rays, causing this fin to appear like two fins. The highest rays of the posterior portion of this fin are much higher than those of the anterior portion, but not as high as the rays of the first dorsal. The extremities of the rays in both fins are bifid.

The pectorals are broad when expanded, slightly rounded; their middle rays the longest. The length of the pectorals is to their height as one to five.

* The ventrals arise just in front of the pectorals.

The anal fin arises on a line just back of the origin of the second dorsal, and terminates on the same plane as that fin. This fin is slightly higher than the dorsal; between the twentieth and twenty-first rays is an emargination similar to that in the dorsal fin, making this also to appear as two.

The caudal fin is but very slightly concave at its posterior extremity.

The fin rays are as follows: — D. 13, 41. P. 13. V. 7. A. 40. C. 23.

Length, one and a half to two feet.

Remarks. When my "Report" was published, in 1839, I stated that the whiting was taken, not however in large quantities, in our Bay in the summer, upon the cod-fishery ground. Since that period, this species has increased very perceptibly in our waters. It is frequently caught in considerable numbers with the hook upon Crab Ledge, a few miles from Boston Light-house, and has become at Provincetown a serious inconvenience to the fishermen. Captain Atwood informs me, that, when the fishermen at the latter place commence the mackerel fishery with nets, which usually takes place about the 20th of May, the whiting are scarce, and few are caught; by the 1st of June they become more plenty; and from the middle of June to the last of the fishery, which closes about the 20th of July, they are exceedingly numerous, in all parts of the bay, in all depths of water. In such quantities are they taken in the nets, that frequently eight or ten hours are required for a man to clear his nets of them. At this season of the year, so many of them are thrown from the boats upon the shore, that the Board of Health are sometimes called upon to interfere, and to compel the fishermen to bury them, from the fear of sickness being produced by their decomposition. While visiting Race Point, the easterly extremity of Cape Cod, in June, 1847, I saw quite a number of

this species strewed along the shore, where they had been left by the tide, while in pursuit of sand-eels and other small fishes. Since that period, the blue-fish having been more common, this species does not exist in as great abundance.

Occasionally this species is brought to market, and when perfectly fresh is a very sweet fish, boiled, broiled, or fried. It soon becomes soft, and is preserved with difficulty. As it does not appear to be known abroad, and the fishermen consequently have no call for it, it is not cured, but is considered worthless. In the months of September and October the whiting is used somewhat for bait for the dog-fish, and answers a good purpose. This species remains upon our coast until late in the autumn, when, the water becoming colder, they disappear.

Dr. Dekay's figure of this species is bad. The second dorsal and anal fins do not show the emargination at all, and the caudal is too deeply concave.

Dr. Dekay thinks that Mitchill was induced to attribute three dorsal fins to this species on account of "the accidental rupture of the membrane." I think this is not the case; but that, owing to this deep emargination, the membrane connecting the nineteenth and twentieth rays was so low as almost to seem like the extremity of a fin.

Massachusetts, STORER. Connecticut, LINSLEY, AYRES. New York, MITCHILL, DEKAY.

GENUS VI. PHYCIS, ARTEDI.

Body elongated. Two dorsal fins, first short, second long; ventral fins with a single ray only at the base, afterwards divided. Chin with one barbule.

PHYCIS AMERICANUS, *Storer*.

The White Hake.

(PLATE XXIX. FIG. 3.)

Enchelyopus Americanus, SCHNEIDER, GRIFFITH'S CUV., x. p. 489.

Gadus longipes, *Codling*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 372, pl. 1, fig. 4.

Phycis furcatus, STORER, Bost. Journ. Nat. Hist., I. p. 418.

Phycis Americanus, *American Hake*, STORER, Report, p. 138.

" " *Codling*, DEKAY, Report, p. 291, pl. 46, fig. 150.

" " STORER, Mem. Amer. Acad., New Series, II. p. 473.

" " " Synopsis, p. 221.

Color. This fish, when first taken, is of a reddish-brown color above, bronzed upon the sides. The throat, and abdomen in front of the anus, are white, thickly sprinkled with minute black dots, causing them to appear almost fuliginous; less of this appear-

ance exists upon the belly and posterior portions of the fish. The snout is tinged with orange. The top of the head in front of the eyes, the cheeks and intermaxillaries, are also dotted. The upper edge of the dorsal fin is black. The pectorals are transparent, and dotted throughout their greater portion. The anal fin is of the color of the abdomen, and is also dotted, and black upon its edge. The caudal fin is reddish, with exceedingly minute black dots; its posterior extremity is black.

These colors fade in death, and the upper portion becomes of a grayish-brown, and the abdomen a dirty white.

Description. Body cylindrical, compressed posteriorly. Length of the head equal to nearly one fourth the entire fish; depth of the body in front of the pectorals one fifth its entire length; depth across from the anus, exclusive of the dorsal fin, about one sixth its length; depth of the body beyond the termination of the dorsal and anal fins equal to about one quarter the last measurement. Head much flattened above, broad, and strongly convex back of the eyes; sides somewhat compressed; snout projecting, rounded; eyes circular, large, prominent; the upper jaw projecting beyond the lower; both jaws are armed with several rows of sharp incurved teeth; five or six of these in the upper jaw, a less number in the lower; teeth also on the vomer; a small portion at the tip of each jaw is without teeth; that in the lower jaw is much the smaller. Tongue large and fleshy. A minute barbule at the chin.

The lateral line commences above and anterior to the posterior angle of the operculum, and curves with the body until it reaches a line opposite the eighteenth ray of the second dorsal, whence it pursues a straight course to the tail.

The first dorsal fin is triangular, and commences just back of the pectorals; its third ray is filamentous, and about twice the length of the fin.

The second dorsal commences just back of the first; its rays gradually diminish in height posteriorly. The membrane connecting the fin rays is much firmer than that of the first dorsal, although, like it, it is transparent; all the rays are slightly free at their tips. This fin terminates just anterior to the commencement of the fleshy portion of the caudal fin.

The pectorals commence just beneath the posterior angle of the operculum; their length is equal to about one fourth their height. They are rounded when expanded.

The ventrals commence at a point just half-way between the base of the pectorals and the angle of the lower jaw; they are composed apparently of a single ray, which bifurcates about its middle; but dissection shows they are formed of two rays, the inferior of which is much the longer.

The anal fin arises some distance back of the second dorsal, and terminates opposite

the termination of that fin; the first ten or eleven rays of this fin are the longest; they diminish in size towards the tail; this fin is not as high as the opposite dorsal.

The caudal fin is long; its rays are nearly even at its extremity; it is but very slightly convex.

The fin rays are as follows: — D. 10, 54. P. 17. V. 2. A. 48. C. 20.

Length, one to three feet.

Remarks. This species is taken in large numbers, between the first of June and the first of September, on muddy bottoms, between Cape Ann and Boston Light-house. In some seasons they are brought to market in October also. They are generally taken in the night with the hook, although they will sometimes take the bait in a cloudy day. Occasionally two thousand pounds' weight, varying in size from three to ten pounds or more, are taken in a single night by one man, where scarcely an individual was captured during the previous day. It sells for about half the price of cod, when fresh. It is a good fish fried and boiled, and is also used for chowder; for the latter purpose, it has perhaps no superior. It is also a valuable fish when salted.

Maine, Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

PHYCIS FILAMENTOSUS, *Storer.*

The Squirrel-Hake.

(PLATE XXIX. FIG. 4.)

Color. The upper part of the body is of a reddish-brown color. The sides are lighter and tinged with orange. The abdomen is of a pure white; the throat is also white. The anal fin is margined with white. Pupil black, irides silvery.

Description. Length of head one fifth that of the body, and rather more than the greatest depth of the fish. Depth at the base of the pectorals one seventh, at anus exclusive of dorsal fin one fifth, at posterior extremities of dorsal fin one twenty-first of the entire length. Top of head much depressed throughout its whole extent. Snout rounded and not very prominent. Eyes moderate; their diameter equal to three quarters the distance between them. Upper jaw projecting far beyond the lower. Teeth numerous, minute, incurved. The lateral line commences just above the operculum, and curves with the body to the tail. Scales very large, smaller upon the head.

The first dorsal fin is triangular; the third ray is filamentous, and from three to five times the length of the fin.

The second dorsal arises directly back of the first; its first few rays are shortest, the

remainder are of a uniform height, to the fleshy portion of the tail. It is stout and rounded, ending abruptly.

The pectorals arise just beneath the posterior angle of the operculum; they are rounded posteriorly.

The ventrals are composed of a single ray, bifurcated at their lower third; the outer portion being the shorter.

The anal fin arises at the posterior extremity of the longer portion of the ventral ray, and about opposite the tenth dorsal ray, on a line with which fin it terminates. The first four or five rays of this fin are the shortest.

The caudal fin is slightly expanded and nearly straight at its extremity.

The fin rays are as follows: — D. 10, 60. P. 16. V. 1. A. 55. C. 18.

Length, seventeen inches.

Remarks. This species is known by the fishermen of Massachusetts Bay as the "Squirrel-Hake." It seldom exceeds two pounds in weight, while the *P. Americanus*, when full grown, often weighs more than thirty pounds.

GENUS VII. BROSMIUS, CUV.

Body elongated; a single dorsal fin extending the whole length of the back. One barbel at the chin. Ventral fins fleshy.

BROSMIUS FLAVESCENS, *Lesueur*.

The Cusk.

(PLATE XXIX. FIG. 2.)

Le Brosme jaune, Brosmius flavescens, LESUEUR, Mémoires du Muséum, v. p. 158, pl. 16.

Gadus (Brosmius) flavescens, LESUEUR, *Yellow Tusk*, RICH., Fauna Boreal. Americ., III. p. 252.

Brosmius vulgaris, CUV., *Cusk*, STORER, Report, p. 136.

" " (?), *Cusk*, DEKAY, Report, p. 289.

Brosmius flavescens, LESUEUR, STORER, Mem. Amer. Acad., New Series, II. p. 473.

" " STORER, Synopsis, p. 221.

Color. The back is of a brownish color in the larger specimens; the sides yellowish, and sometimes of a decided yellow; frequently, in very large specimens, the fish is whitish, with brownish patches, appearing as if abraded; beneath, white. In the smaller specimens, the body is of a uniform dark-slate color in some specimens; while in others six or eight transverse yellow bands are seen. The dorsal, anal, and caudal

fins are bordered with black or blue-black, and edged throughout with a white margin. The pectorals are of the color of the sides. The ventrals are fuliginous.

Description. Body cylindrical, compressed posterior to the anus, tapering to a point at the fleshy extremity of the caudal fin. The top of the head is flattened. A slight furrow between the nape of the neck and the dorsal fin. The upper jaw is slightly longer than the lower; several rows of prominent, sharp, incurved teeth upon the jaws; the innermost row of those upon the lower jaw the longest; similar teeth upon the palatine bones. The mouth is large, its vertical gape being nearly equal to three fifths the length of the head. A single barbel, about one fifth the length of the head, is suspended from the chin. The eyes are horizontally oval; the distance between them is rather greater than their longest diameter. The posterior nostril is situated directly in front of the anterior angle of the eye; a tubular cirrus projects from the anterior, which is much the smaller.

The lateral line commences just back of the eye, and curves backwards and downwards to a line above the origin of the anal fin, whence it pursues a straight course to the caudal rays.

The dorsal fin arises on a line above the anterior half of the pectorals; its height at its origin is equal to about one fifth the length of the head; it continues of this height until near its posterior termination. It is rounded at its extremity, and is continued to the caudal rays, with which it unites.

The pectorals are rounded posteriorly, and are equal in their height to two fifths the length of the head.

The fleshy ventrals are situated anterior to the pectorals, and are about the same height as those fins; the extremities of their rays are free.

The anal fin arises at a distance back of the termination of the pectorals equal to about one fifth the length of the fish; this fin terminates opposite the termination of the dorsal, and, like that fin, is united to the caudal rays.

The caudal fin is rounded when expanded.

The anus is small, and situated just in front of the anal fin.

The fin rays are as follows: — D. 98. P. 24. V. 5. A. 71. C. 34.

Length, two to three feet.

Remarks. This fine species is commonly taken on ledges in deep water; it is frequently caught upon the Middle Bank, between Cape Cod and Cape Ann, with the hook, while fishing for cod. In the spring of the year it is occasionally met with in Boston market, but does not sell as readily as the cod; in the winter season it is more rare, and not unfrequently sells for double the price of that species. It is an excellent

fish, and is considered by those best acquainted with it, when fresh, quite a delicacy, and, when salted, preferable to the cod. A large quantity of oil is procured from its liver, which is sometimes preserved by the fishermen for external application to burns. This species grows to the weight of thirty pounds. Captain Atwood informs me that he has never known an individual to be taken on the Cape Cod shore of Massachusetts Bay.

Massachusetts, LESUEUR, STORER.

FAMILY XIX. PLANIDÆ.

Body flat, compressed vertically. Upper surface dusky, and of various colors; beneath white. Dorsal single, extending the whole length of the back. Both eyes placed on the same side of the head. No air-bladder. Branchial rays six.

GENUS I. HIPPOGLOSSUS, Cuv.

Eyes and colored surface on the right side. The fins are similar to those of the species of the genus *Platessa*; the jaws and the pharynx are armed with teeth that are sharper and stronger, and the form of the body is more elongated.

HIPPOGLOSSUS VULGARIS, Cuv.

The Halibut.

(PLATE XXX. FIG. 1.)

Pleuronectes hippoglossus, LIN., Syst. Nat., p. 456.

“ “ *Holybut*, BLOCH, II. p. 44, pl. 47.

“ “ FABRICIUS, Fauna Grœnlandica, p. 161.

“ “ *Holibut*, SHAW, Gen. Zoöl., IV. p. 295.

“ “ “ PENNANT, Brit. Zoöl., III. p. 302.

“ “ *Halibut*, MITCH., Trans. Lit. and Phil. Soc. of N. Y., I. p. 386.

Hippoglossus vulgaris, *Holibut*, JENYNS, Brit. Vert., p. 460.

“ “ GRIFFITH'S CUV., X. p. 494.

“ “ YARRELL, Brit. Fish., 1st edit., II. p. 230; 2d edit., II. p. 321.

“ “ STORER, Report, p. 145.

“ “ DEKAY, Report, p. 294, pl. 49, fig. 157.

“ “ STORER, Mem. Amer. Acad., New Series, II. p. 475.

“ “ “ Synopsis, p. 223.

Color. The entire right side of this species of an almost uniform dark-brown; the left side of a pure white. Very rarely, an individual is caught having the left side also brown.

Description. Body elongated. The length of the head is equal to one fourth the length of the entire fish. The eyes are large, oblong; their longest diameter equal to the distance between them. The lips are large and fleshy. The lower jaw the longer. The jaws are furnished with two rows of strong, sharp teeth, the inner of which is larger and incurved. The nostrils are double; the anterior is tubular, the posterior the larger.

The lateral line commences at the posterior superior angle of the operculum, and, making a high curve above the pectorals, assumes just back of their posterior extremity a straight line, which is continued to the rays of the caudal fin.

The dorsal fin arises over the anterior third of the eye, and terminates at the fleshy portion of the caudal fin. The highest rays of this fin are six times the height of those above the base of the pectorals.

The pectorals arise just back of the posterior angle of the operculum.

The ventrals are small, and situated beneath the base of the pectorals. The third ray is the longest.

The anal fin arises beneath the posterior half of the pectorals, and terminates opposite the dorsal fin.

Two apertures anterior to the anal fin; the anterior, the anus; the posterior, the smaller, the urinary outlet.

The fin rays are as follows, in two specimens examined:—

D. 99. P. 17. V. 6. A. 73. C. 18.

D. 100. P. 16. V. 6. A. 74. C. 17.

Length, three to six feet.

Remarks. In some rare instances, the eyes of this species are reversed, being situated on the left side of the fish.

By far the greatest quantity of halibut brought to Boston market is taken at George's Banks, twenty thousand pounds' weight being frequently captured at that place in a day or two, by the crew of a single smack, constituting what is called a "trip." Considerable numbers, however, are taken along our coast. Nantucket Shoals have for many years been a favorite resort for the halibut fishers, and formerly many were taken there. Captain Atwood informs me that, with a crew of eight men, he has captured there in a single day 7,300 pounds' weight of this species. They have of late years become more scarce. In the spring of 1845, four men, from the 20th of April to the 15th of May, landed 13,000 pounds, which they took on the south side of Cape Cod, and which sold in Boston market for \$390. About eight or nine miles directly north of Race Point is a bank, which is called the Middle Bank; between this bank and Race Point the water is from about twenty-five to twenty-eight fathoms deep, with a

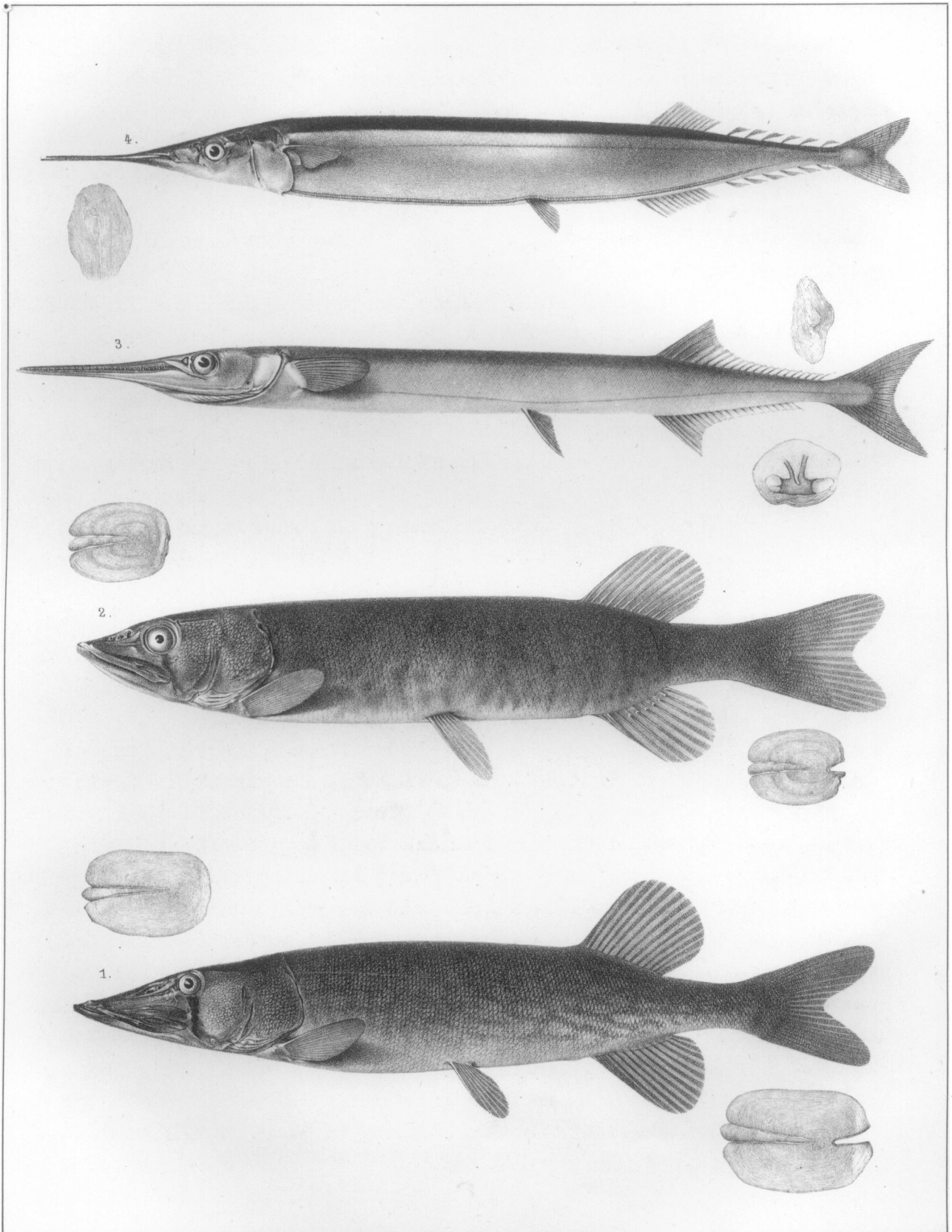
hard clayey bottom. This is called the "Gully." In the summer, this species strays up Massachusetts Bay, and scatters all along the shoal water, upon the hard bottoms; but in winter it goes back to this "Gully," and there remains during the cold weather. The reasons appear to be obvious. The shoal water would be too cold a situation for them during the winter; and the middle of the bay has a muddy bottom, which it avoids. Halibut were first taken in this "Gully" about twenty years since, and for several successive seasons the fishery was quite a lucrative business, but at present the fish are very scarce there. In the most successful year's fishery at this place, about 75,000 pounds of halibut were taken by the Provincetown fishermen. When the halibut were first caught at the "Gully," they averaged nearly one hundred pounds each; thirteen fish captured at one time weighed 2,043 pounds; those taken afterwards were smaller, and during the second and third years' fishery, they weighed sixty pounds or less upon an average.

An unusual number of halibut were brought to Boston market in the early part of 1837. Eighty large schooners, of from sixty to eighty tons' burden, belonging to Cape Ann, were thus employed. Captain Nathaniel Blanchard, of Lynn, one of our oldest fishermen, and to whom I am indebted for many valuable facts in the preparation of this report, informs me that the largest individual of this species he ever saw weighed 386 pounds. The late Mr. Lemuel Newcomb, then the oldest fishmonger in Boston market, stated to me in 1847, that, forty years before, a halibut was taken upon the South Shore, and brought to Boston, which, after the head and bowels were removed, weighed 420 pounds. This specimen when perfect must have weighed nearly 500 pounds.

For a knowledge of the largest specimen of which I have heard, I am indebted to Mr. Anthony Holbrook, a fishmonger in Boston market, — for many years a practical fisherman, and possessing an unusually extensive knowledge of our fishes, and a man of unimpeachable veracity. He assures me that a halibut weighing upwards of 600 pounds was taken at New Ledge, sixty miles southeast of Portland, Maine, in 1807.

This species feeds upon other fishes. In its stomach are frequently found portions of haddock, rays, menhaden, mackerel, herring, the eel-shaped blenny, &c. Its flesh is rather coarse and dry, but by many is much esteemed; when fresh, the fins are a great delicacy, as also when pickled and packed. When fresh, this species sells for a higher price than the cod. Large quantities are also smoked, and occasionally the dried flesh is eaten.

Greenland, FABRICIUS. Maine and Massachusetts, STORER. Connecticut, LINSLEY. New York, MITCHILL, DEKAY.

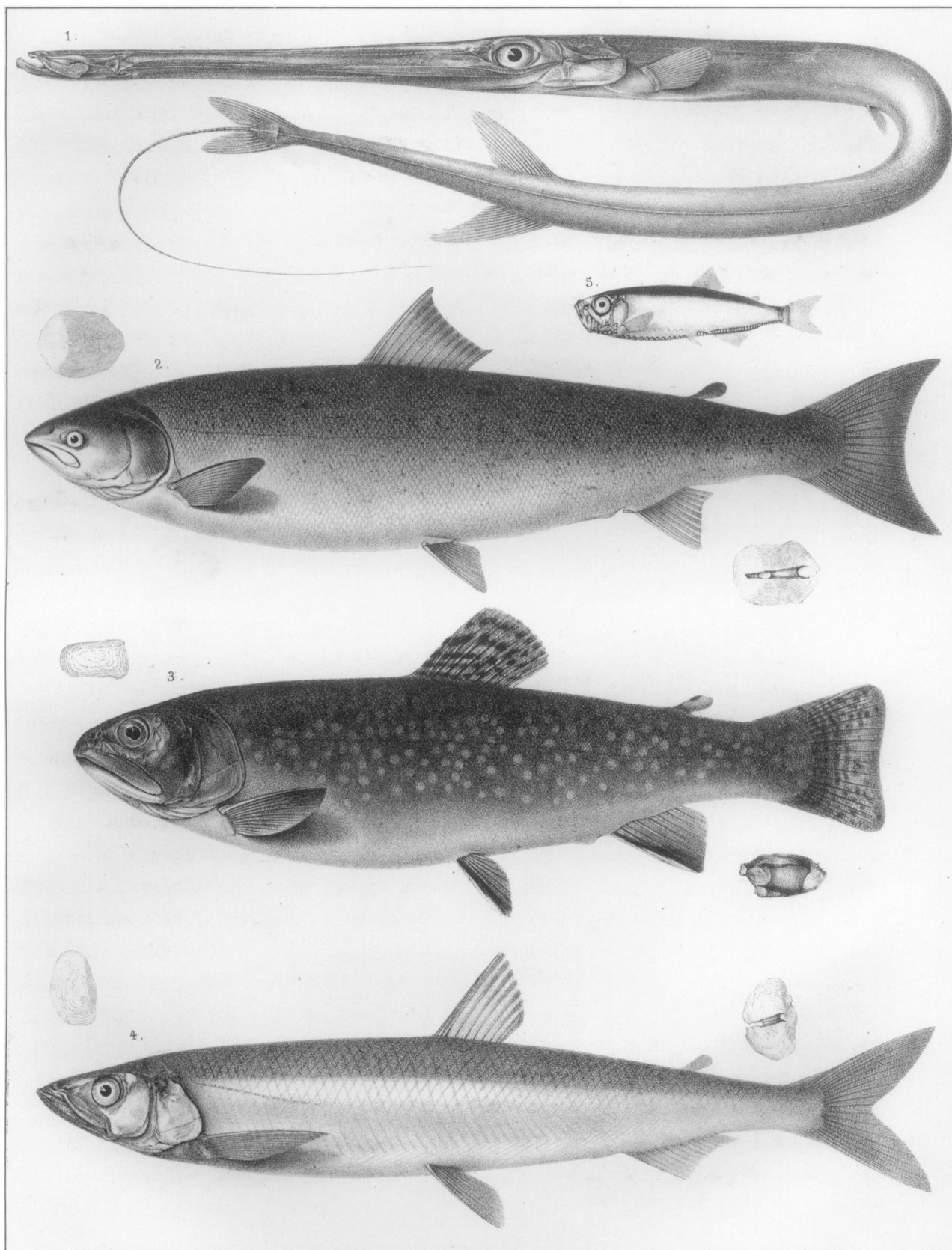


A. Sonrel.

L.H. Bradford & Co. print.

1. *ESOX RETICULATUS* LeS.
 3. *BELONE TRUNCATA* LeS.

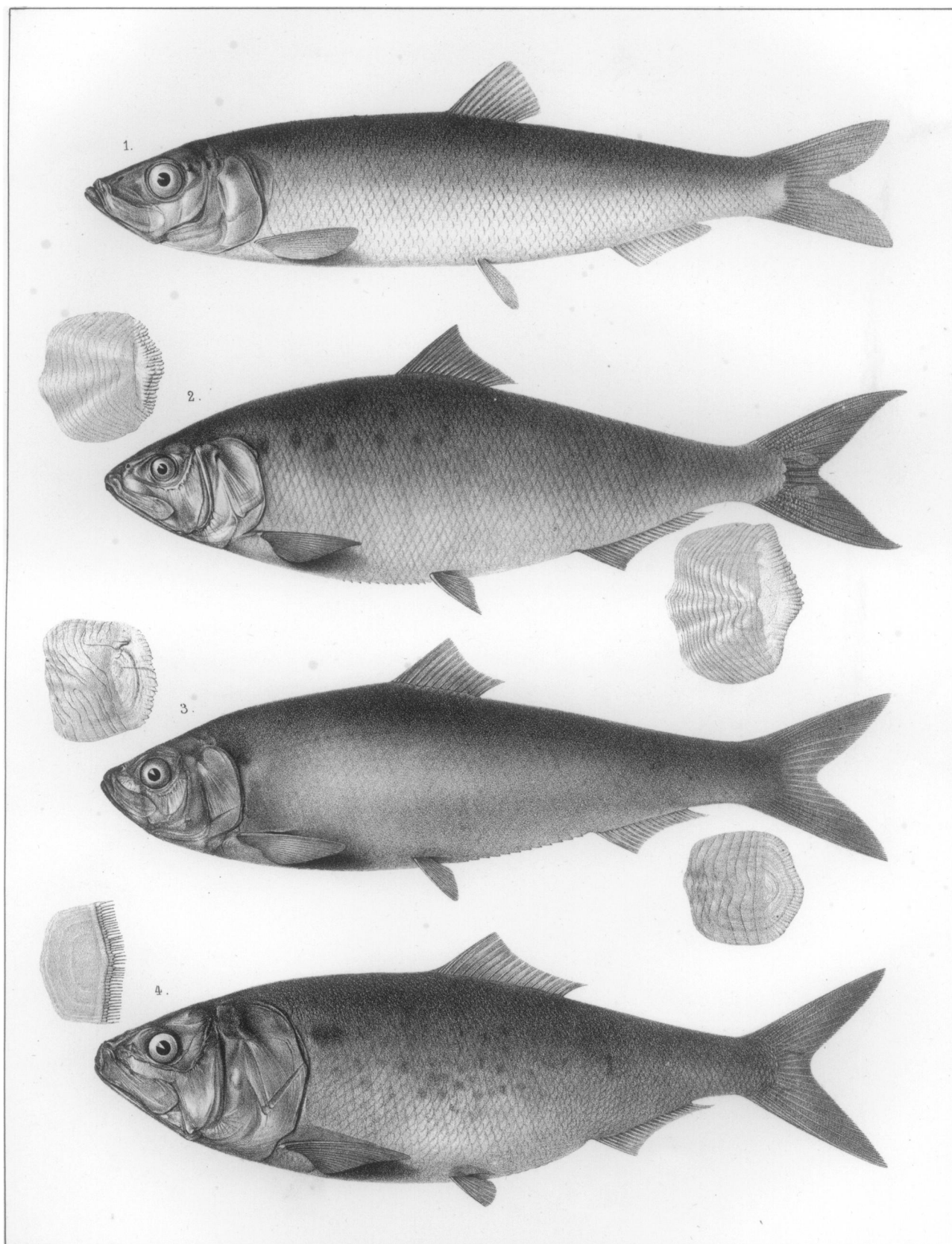
2. *ESOX ORNATUS* Gir.
 4. *SCOMBERESOX STORERI* Dek.



A. Sonrel.

L. H. Bradford & Co print.

- | | | |
|------------------------------|-----------------------------|-------------------------|
| 1. FISTULARIA SERRATA Bloch. | 2. SALMO SALAR Linn. | 3. S. FONTINALIS Mitch. |
| 4. OSMERUS VIRIDESCENS LeS. | 5. SCOPELUS HUMBOLDTII Cuv. | |

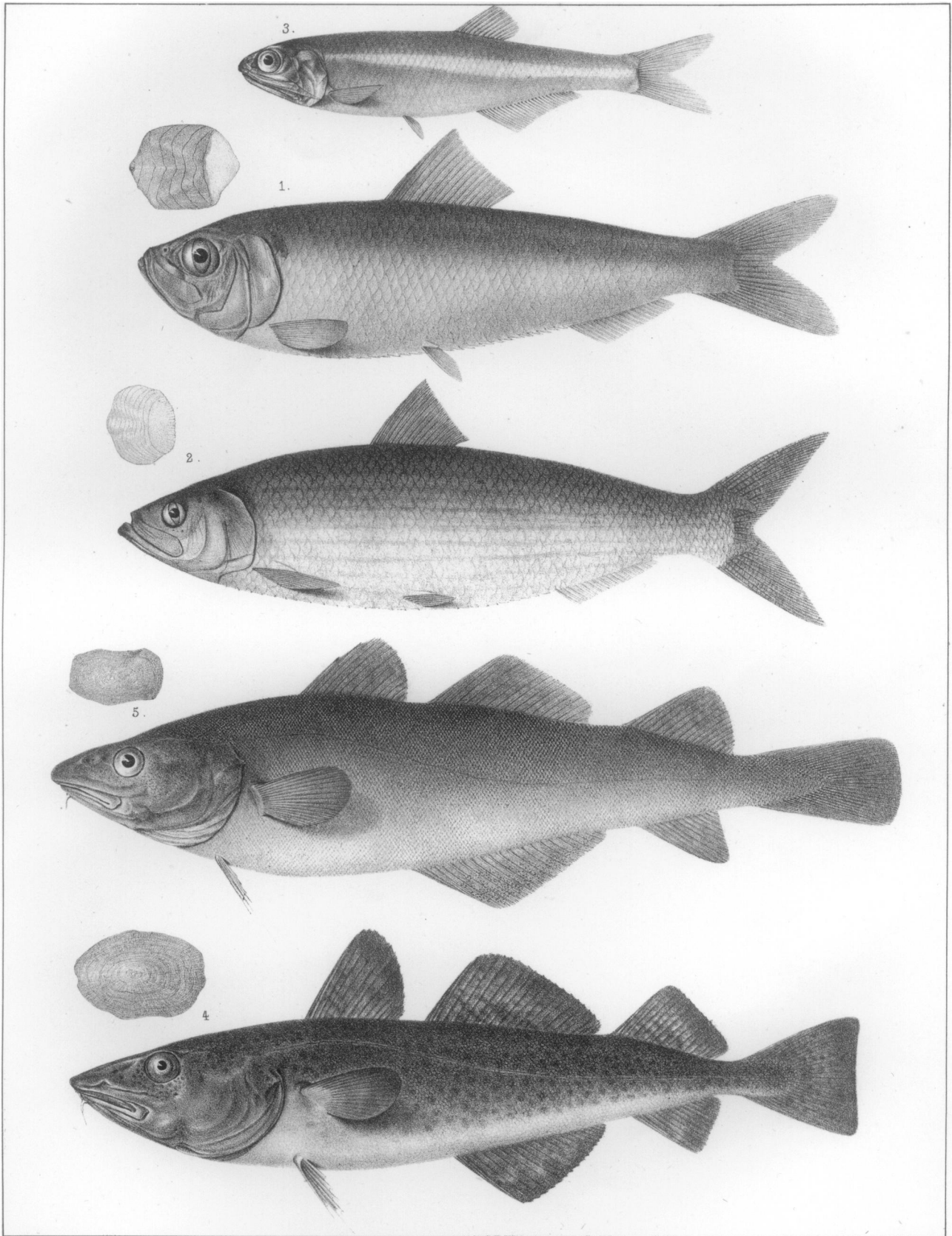


A. Sonrel.

L.H. Bradford & Co. print.

1. CLUPEA ELONGATA LeS.
3. ALOSA TYRANNUS Dek

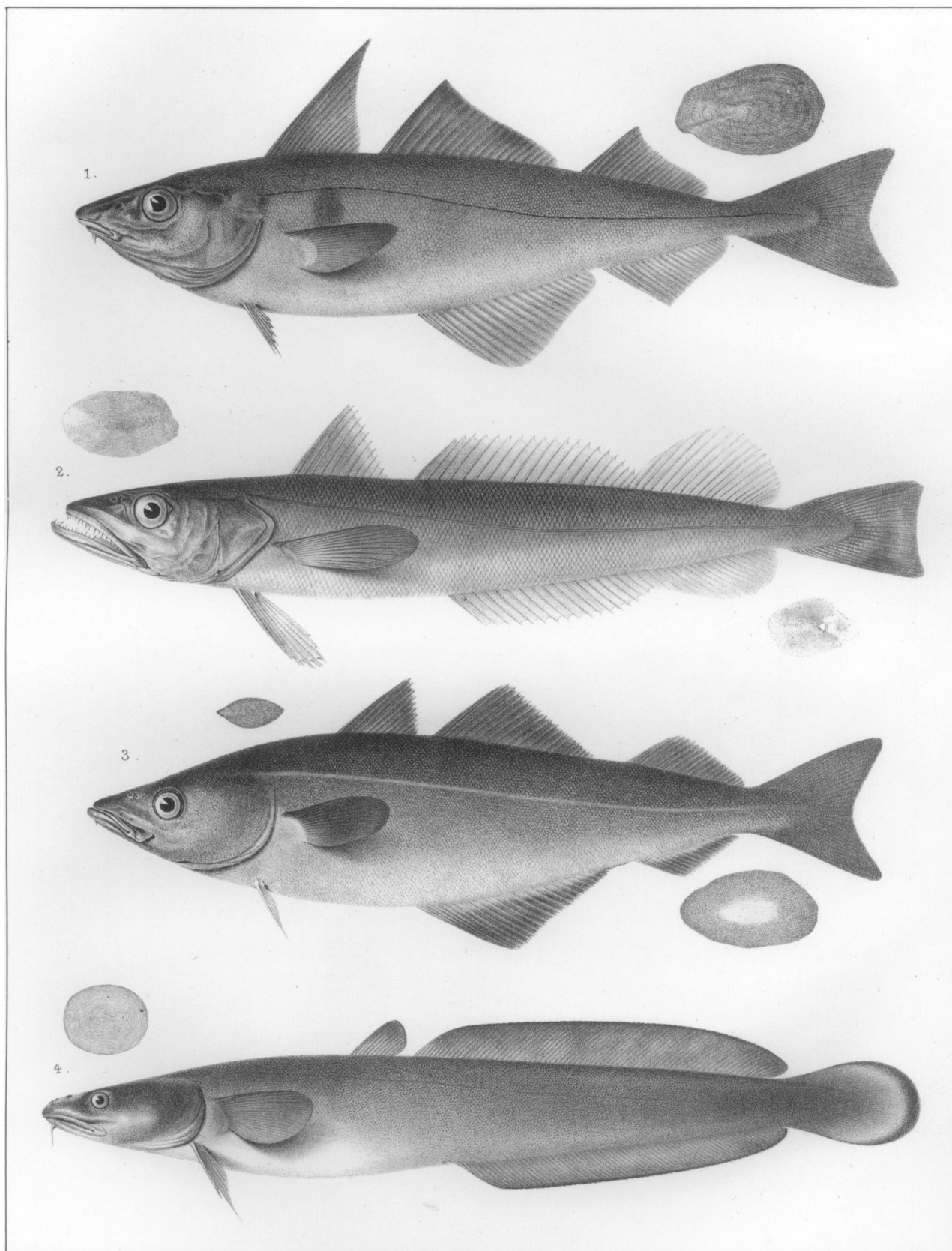
2. ALOSA PRAESTABILIS Dek.
4. A. MENHADEN Storer.



A. Sorel.

L. H. Bradford & Co. print.

1. *ALOSA CYANONOTON* Storer. 2. *A. LINEATA* Storer. 3. *ENGRAULIS VITTATUS* B. & G.
 4. *MORRHUA AMERICANA* Storer. 5. *M. PRUINOSA* Dek.

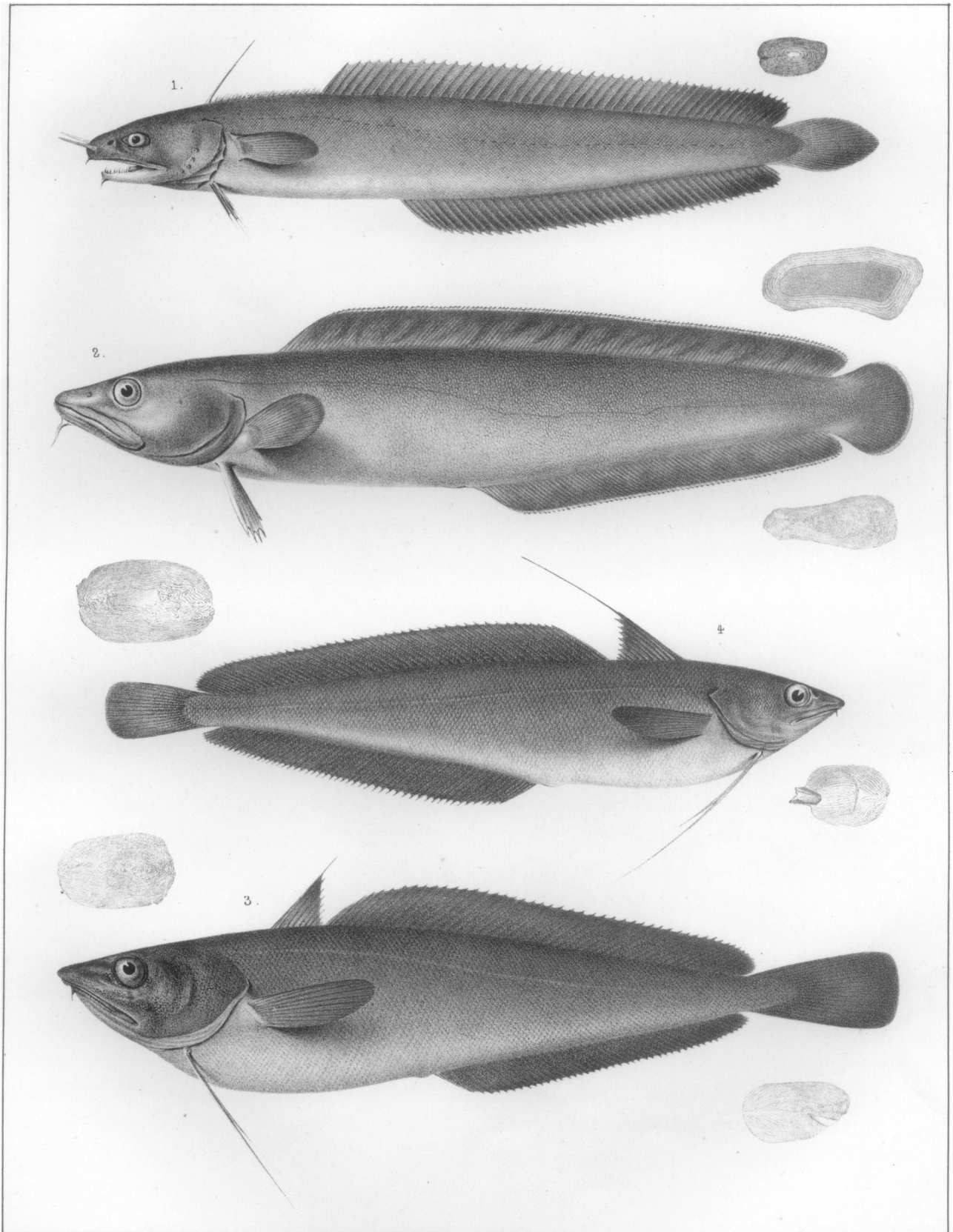


A. Sonnel.

L. H. Bradford & Co. print.

1. MORRHUA AEGLEFINUS Linn.
3. MERLANGUS PURPUREUS Storer.

2. MERLUCIUS ALBIDUS Dek.
4. LOTA COMPRESSA LeS.



A. Sonnet.

L. H. Bradford & Co print.

1. MOTELLA CAUDACUTA Storer
3. PHYCIS AMERICANUS Storer

2. BROSMIUS FLAVESCENS Les.
4. P. FILAMENTOSUS Storer